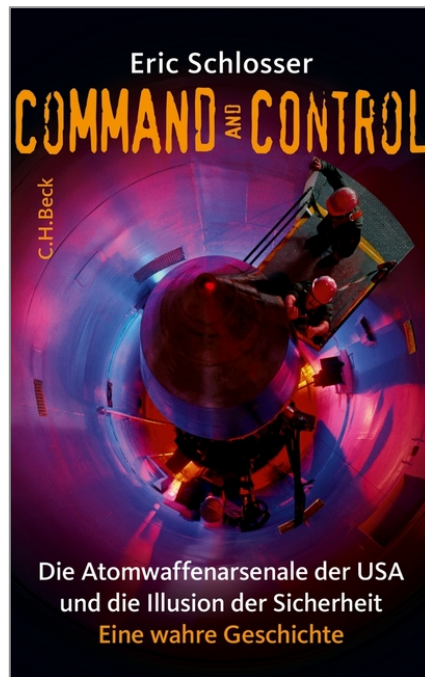


## Anmerkungen



**Eric Schlosser**  
**Command and Control**

Die Atomwaffenarsenale der USA und die  
Illusion der Sicherheit  
Eine wahre Geschichte

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# ANMERKUNGEN ZU:

Eric Schlosser

## COMMAND AND CONTROL

### DIE ATOMWAFFENARSENALE DER USA UND DIE ILLUSION DER SICHERHEIT EINE WAHRE GESCHICHTE

Da die meisten zitierten Dokumente in englischer Sprache sind, wurden die Anmerkungen nicht in Deutsche übersetzt. Die Zahlen in Klammern beziehen sich auf die Seiten der englischen Originalausgabe von „Command & Control“.

#### ERSTER TEIL: DIE TITAN

##### NICHT GUT

- 16 (3) *Senior Airman David F. Powell and Airman Jeffrey L. Plumb:* I spoke to Plumb and Powell about the accident. Plumb’s statement before the Missile Accident Investigation Board can be found at Tab U-71 and Powell’s at Tab U-73, “Report of Missile Accident Investigation: Major Missile Accident, 18–19 September 1980, Titan II Complex 374-7, Assigned to 308th Strategic Missile Wing, Little Rock Air Force Base, Arkansas,” conducted at Little Rock Air Force Base, Arkansas, and Barksdale Air Force Base, Louisiana, December 14–19, 1980.
- 16 (3) *10 feet in diameter and 103 feet tall:* According to the Titan II historian David K. Stumpf, the height of the missile was often erroneously described as “anywhere from 108 feet to 114 feet.” The actual height was 103.4 feet. See “Table 3.2, Titan II ICBM Final Design Specifications,” in David K. Stumpf, *Titan II: A History of a Cold War Missile Program* (Fayetteville: University of Arkansas Press, 2000), p. 49.

- 16 (3) *a yield of 9 megatons*: The yields of American nuclear weapons remain classified, except for those of the bombs that destroyed Hiroshima and Nagasaki. But for decades government officials have discussed those yields, off the record, with journalists. Throughout this book, I cite the weapon yields published by a pair of reliable defense analysts. For some reason, the megatonnage of the warheads carried by the Titan and Titan II missiles was disclosed in a document obtained by the National Security Archive through the Freedom of Information Act. For the yields of the W-38 warhead atop the Titan and the W-53 atop the Titan II, see “Missile Procurement, Air Force,” U.S. Congress, House Committee on Appropriations, Subcommittee on Defense, May 16, 1961 (secret/declassified), NSA, p. 523. For the yields of other American weapons, see Norman Polmar and Robert S. Norris, *The U.S. Nuclear Arsenal: A History of Weapons and Delivery Systems Since 1945* (Annapolis, MD: Naval Institute Press, 2009), pp. 1–70.
- 16 (3) *about three times the explosive force of all the bombs*: Although estimates vary, the American physicist Richard L. Garwin and the Russian physicist Andrei Sakharov both noted that the explosive force of all the bombs used during the Second World War was about 3 megatons. The United States was responsible for most of it. According to Senator Stuart Symington, who’d served as the first secretary of the Air Force after the war, the bombs dropped by the United States had a cumulative force of 2.1 megatons. Two thirds of that amount was employed against Germany, the rest against Japan. The enormous power of the Titan II’s warhead seems hard to comprehend. Nine megatons is the equivalent of eighteen billion pounds of TNT—about four pounds of high explosives for every person alive in September 1980. Symington’s estimates can be found in “Military Applications of Nuclear Technology,” Hearing Before the Subcommittee on Atomic Energy, 93rd Cong., April 16, 1973, pt. 1, pp. 3–4. For the other estimates, see Richard L. Garwin, “New Weapons/ Old Doctrines: Strategic Warfare in the 1980s,” *Proceedings of the American Philosophical Society*, vol. 124, no. 4 (1980), p. 262; and Andrei Sakharov, “The Danger of Thermonuclear War,” *Foreign Affairs*, Summer 1983, p. 1002.
- 16 (4) *“hypergolic”*: The word, according to rocket scientists, means “spontaneously ignitable.” One of the advantages of using hypergolic

propellants is that the propellants eliminate the need for an ignition system in a missile. One of the disadvantages is how dangerous they are. For a good introduction to the subject, see B. M. Nufer, “A Summary of NASA and USAF Hypergolic Propellant Related Spills and Fires,” National Aeronautics and Space Administration, NASA/TP-2009- 214769, June 2009. For a more thorough examination, see the chapters “Liquid Propellant Rocket Engine Fundamentals” and “Liquid Propellants” in George P. Sutton and Oscar Biblarz, *Rocket Propulsion Elements*, 7th ed. (New York: Wiley, 2001), pp. 197–267.

- 17 (4) *supersonic convergent-divergent nozzles*: Shaped like an hourglass, a convergent-divergent nozzle increases the velocity of a hot gas by forcing it through a narrow chamber.
- 17 (4) *The fuel, Aerozine-50*: A brief overview of the Titan II’s propellants and their hazards can be found in “Propellant Transportation Awareness Guide for Titan II Deactivation,” Department of the Air Force, October 1, 1982. A more detailed account is offered in “Titan II Storable Propellant Handbook,” Revision B, Bell Aerosystems Company, Prepared for Air Force Ballistic Systems Division, March 1963.
- 18 (5) *a Rocket Fuel Handler’s Clothing Outfit (RFHCO)*: For a description of the gear and its proper use, see “Missile Liquid Propellant Systems Maintenance Specialist: Volume 3, Propellant Transfer System,” CDC 4551, Extension Course Institute, Air Training Command, February 1983, pp. 1–42.
- 20 (6) *Electroexplosive devices were used*: For the various things that could explode in a Titan II silo and the potential risks, see “Nuclear Weapon Specialist: Volume 5, Rockets, Missiles, and Reentry Systems,” CDC 46350, Extension Course Institute, Air Training Command, November 1980 (for official use only), pp. 19–38.
- 20 (7) *Technical Order 21M-LGM25C-2-12, Figure 2-18*: The relevant excerpt of the tech order can be found in “Titan II Class A Mishap Report: Serial Number 62-0006, 18 September 1980, Damascus, Arkansas,” Eighth Air Force Mishap Investigation Board, October 30, 1980, p. 0-1.
- 21 (7) *“Oh man,” Plumb thought*: Interview with Jeffrey L. Plumb.

## NEW WAVE

- 22 (8) *Second Lieutenant Allan D. Childers had gotten out of bed*: I spoke to Childers at length about that day. His testimony before the accident investigation board can be found in “Report, Major Missile Accident, Titan II Complex 374-7,” Tab U-13.
- 25 (11) *the Dash-1*: An abridged version has been published: *Technical Manual, USAF Model LGM-25C, Missile System Operation* (Tucson: Arizona Aerospace Foundation, 2005).
- 26 (12) *“the hostile invasion ... by the Iraqi regime”*: Quoted in “Iran Criticizes Iraq for Ending ’75 Pact,” *New York Times*, September 19, 1980.
- 27 (13) *the International Institute for Strategic Studies ... issued a report*: The title of the report was “The Military Balance, 1980–1981.” See Louis Nevin, “Soviets and Warsaw Pact Have Weapons Lead Over West,” Associated Press, September 17, 1980.
- 27 (13) *an unemployment rate of about 8 percent*: President Carter cited that figure while speaking to reporters on September 18, 1980. See “Transcript of the President’s News Conference,” *New York Times*, September 19, 1980.
- 27 (13) *“a crisis in confidence”*: For the complete speech, see “Text of President Carter’s Address to the Nation,” *Washington Post*, July 16, 1979.
- 27 (13) *an official report on the failed rescue attempt*: See “Rescue Mission Report,” Joint Chiefs of Staff, Special Operations Review Group, August 1980.
- 28 (14) *77 percent of the American people disapproved*: President Nixon’s disapproval rate never exceeded 71 percent. These ratings are cited in Donald M. Rothberg, “Carter Plunges in Polls, But Campaign Chief Insists He’ll Win,” Associated Press, July 30, 1980.
- 28 (14) *“I refuse to accept [Carter’s] defeatist and pessimistic view”*: See “Transcript of Reagan Speech Outlining Five-Year Economic Program for the U.S.,” *New York Times*, September 10, 1980.
- 28 (14) *“four more years of weakness, indecision, mediocrity”*: See “Text of Reagan’s Speech Accepting Republicans’ Nomination,” *New York Times*, July 18, 1980.

- 28 (14)            *“a bumbler”*: Quoted in “Interview with John B. Anderson,” *BusinessWeek*, September 8, 1980.
- 28 (14)            *“People feel that the country is coming apart”*: Quoted in *ibid.*
- 28 (14)            *a bestselling nonfiction book in late September*: See Edwin McDowell, “Behind the Best Sellers; ‘Crisis Investing,’” *New York Times*, September 21, 1980. 15 *“In the last few years before the outbreak of war”*: John Hackett, *The Third World War: August 1985* (New York: Macmillan, 1978), p. 316.
- 29 (15)            *Ronald Reagan later called The Third World War*: In 1983, President Reagan told the *New York Times* that *The Third World War* was the most important book that he’d read for work that year. See “Reading for Work and Pleasure,” *New York Times*, December 4, 1983.
- 29 (15)            *the techno-thriller*: For Hackett’s role in creating the new genre, see J. William Gibson, “Redeeming Vietnam: Techno-Thriller Novels of the 1980s,” *Cultural Critique*, no. 19 (Fall 1991), pp. 179–202.
- 29 (16)            *“Life begins at forty”*: Quoted in David Sheff, *All We Are Saying: The Last Major Interview with John Lennon and Yoko Ono*, ed. G. Barry Golson (New York: St. Martin’s Griffin, 2000), p. 8.
- 30 (16)            *“Politics and rebellion distinguished the ‘60’s”*: Jerry Rubin, “Guess Who’s Coming to Wall Street,” *New York Times*, July 30, 1980.
- 31 (16)            *the highest-paid banker ... earned about \$710,000 a year*: Roger E. Anderson earned \$710,440 in 1980, an income that would be roughly \$2 million in today’s dollars. A few years later, Anderson was forced to leave Continental Illinois, and the Federal Deposit Insurance Corporation subsequently took it over—at the time, the largest bank bailout in American history. For Anderson’s salary, see L. Michael Cacage, “Who Earned the Most?,” *American Banker* (May 29, 1981). The story of how Anderson’s bank collapsed remains sadly relevant. See “Continental Illinois and ‘Too Big to Fail,’” in *History of the Eighties: Lessons for the Future, Vol. I* (Washington, D.C.: Federal Deposit Insurance Corporation, Division of Research and Statistics, 1997), pp. 235–57.
- 31 (17)            *“There is a tidal wave coming”*: Quoted in Ernest B. Furgurson, “Carter as Hoover, Reagan as F.D.R.? Socko!,” *Los Angeles Times*, July 22, 1980.

## ALLEIN KEIN ZUTRITT

- 33 (19) *political, as well as military, considerations*: According to one historian, Congressman Wilbur D. Mills agreed to support a reduction in corporate taxes—and in return Arkansas got the Titan II bases. See Julian E. Zelizer, *Taxing America: Wilbur D. Mills, Congress, and the State, 1945–1975* (New York: Cambridge University Press, 2000), p. 187.
- 35 (21) *It weighed roughly six thousand pounds*: Cited in Stumpf, *Titan II*, p. 118.
- 35 (21) *steel doorjambes ... weighed an additional thirty-one thousand pounds*: Ibid.
- 36 (22) *Rodney Holder was once working in the silo*: Interview with Rodney L. Holder.
- 36 (23) *Launch Complex 373-4 had been the site of the worst Titan II accident*: My account of the Searcy accident is based primarily on “Report of USAF Aerospace Safety Missile Accident Investigation Board, Missile Accident LGM-25C-62-006, Site 373-4,” Little Rock Air Force Base, August 9, 1965 (official use only); “Launch Operations and Witness Group Final Report,” submitted to USAF Aerospace Safety Missile Accident Investigation Board, Missile Accident LGM-25C-62-006, Site 373-4, n.d., (official use only); and Charles F. Strang, “Titan II Launch Facility Accident Briefing, Little Rock Air Force Base, Arkansas,” minutes of the Ninth Explosives Safety Seminar, Naval Training Center, San Diego, California, August 15–17, 1967 (no foreign without the approval of the armed services explosives safety board); and Stumpf, *Titan II*, pp. 215–21.
- 37 (23) *(serial number 62-0006)*: Cited in “Witness Group Final Report,” p. 1.
- 37 (23) *You and the Titan II*: Ibid., p. 11.
- 39 (25) *an “explosive situation”*: Ibid., p. 4.
- 40 (26) *Gary Lay insisted that nobody had been welding*: See Linda Hicks, “Silo Survivor Tells His Story,” *Searcy Daily Citizen*, May 7, 2000.
- 41 (27) *the launch checklist went something like this*: I have presented a somewhat abbreviated version of the checklist. For the complete one, see *Technical Manual, USAF Model LGM-25C, Missile System Operation* (Tucson: Arizona Aerospace Foundation, 2005). fig. 3-1, sheets 1–3.

- 48 (32) *The missile's serial number was 62-0006*: See “Titan II Class A Mishap Report, Serial Number 62-0006, 18 September 1980, Damascus Arkansas,” Eighth Air Force Mishap Investigation Board, October 30, 1980, p. 0-1.
- 49 (33) *“Dang,” Holder thought*: Holder interview.

## KUGELN IN KUGELN

- 50 (35) *Sergeant Herbert M. Lehr had just arrived*: Interview with Herbert M. Lehr. I am grateful to Lehr for describing that historic day in New Mexico. His memory, at the age of ninety, seemed better than mine. An account of Lehr’s work for the Manhattan Project can be found at the Library of Congress: Herbert Lehr Collection (AFC/2001/001/12058), Veterans History Project, American Folklife Center.
- 50 (36) *the most expensive weapon ever built*: By the end of 1945, about \$1.9 billion had been spent on the Manhattan Project—roughly \$24.7 billion in today’s dollars. See Richard G. Hewlett, and Oscar E. Anderson, Jr., *The New World: A History of the United States Atomic Energy Commission, vol.1, 1939–1946* (University Park, PA: Pennsylvania State University Press, 1962), p. 723.
- 51 (36) *Ramsey bet the device would be a dud*: For the yield predictions made by Ramsey, Oppenheimer, Teller, and other Manhattan Project scientists, see Richard Rhodes, *The Making of the Atomic Bomb* (New York: Simon & Schuster, 1986), p. 657.
- 51 (36) *odds of the atmosphere’s catching fire were about one in ten*: According to the physicist Victor Weisskopf, a fear that the atmosphere might ignite caused one of his colleagues at Los Alamos to have a nervous breakdown. See the interview with Weisskopf in Denis Brian, *The Voice of Genius: Conversations with Nobel Scientists and Other Luminaries* (New York: Basic Books, 2001), pp. 74–75.
- 51 (36) *“tickling the dragon’s tail”*: For the origins of the term, see Lillian Hoddeson, Paul W. Henriksen, Roger A. Meade, and Catherine Westfall, *Critical Assembly: A Technical History of Los Alamos During the Oppenheimer Years, 1943–1945* (New York: Cambridge University Press,



- 1993), pp. 346–48. For a firsthand account of the dangerous experiments, see Frederic de Hoffmann, “‘All in Our Time’: Pure Science in the Service of Wartime Technology,” *Bulletin of the Atomic Scientists*, January 1975, pp. 41–44.
- 52 (37) “*So I took this heavy ball in my hand*”: Quoted in James P. Delgado, *Nuclear Dawn: From the Manhattan Project to the Bikini Atoll* (Oxford: Osprey Publishing, 2009), p. 59.
- 52 (37) *the “ultimate explosive”*: H. G. Wells, *The World Set Free: A Story of Mankind* (New York: E. P. Dutton, 1914), p. 117.
- 52 (37) “*carry about in a handbag*”: Ibid., p. 118.
- 52 (37) “*The catastrophe of the atomic bombs*”: Ibid., p. 254. Wells was an early proponent of world government, and his complex, often contradictory views on the subject are explored in Edward Mead Earle, “H. G. Wells, British Patriot in Search of a World State,” *World Politics*, vol. 2, no. 2 (January 1950), pp. 181–208.
- 52 (37) “*it may become possible*”: The full text of the letter, as well as Roosevelt’s response to it, can be found in Cynthia C. Kelly, ed., *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians* (New York: Black Dog & Leventhal, 2007), pp. 42–44.
- 53 (37) “*extremely powerful bombs of a new type*”: Ibid., p. 43.
- 53 (38) *Conventional explosives, like TNT*: I am grateful to members of the New York Police Department Bomb Squad not only for teaching me how high explosives work but also for demonstrating some of them for me in the field. See Eric Schlosser, “The Bomb Squad,” *Atlantic Monthly*, January 1994.
- 53 (38) *similar to the burning of a log in a fireplace*: Ibid.
- 53 (38) *temperatures reach as high as 9,000 degrees*: Cited in Samuel Glasstone, ed., *The Effects of Nuclear Weapons* (Washington, D.C.: U.S. Government Printing Office, 1964), p. 29. Glasstone’s book does an unsurpassed job of explaining what nuclear weapons can do. The original edition appeared in 1950, the last edition in 1977—and the one cited here comes with a round, plastic “nuclear effects computer,” similar to a slide rule, that allows you to

- calculate the maximum overpressures, wind speeds, and arrival times of various nuclear blasts, depending on how far you're standing from them.
- 53 (38) *1.4 million pounds per square inch*: Cited in Schlosser, "The Bomb Squad."
- 53 (38) *tens of millions degrees Fahrenheit*: See Glasstone, *Effects of Nuclear Weapons*, p. 24.
- 53 (38) *many millions of pounds per square inch*: Ibid., p. 29.
- 54 (39) *The largest building in the world*: Cited in Michael Kort, *The Columbia Guide to Hiroshima and the Bomb* (New York: Columbia University Press, 2007), p. 22.
- 55 (40) *"the Introvert"*: See Hoddeson et al., *Critical Assembly*, p. 86.
- 55 (40) *"The more neutrons—the more fission"*: "Survey of Weapon Development and Technology" (WR708), Sandia National Laboratories, Corporate Training and Development, February 1998 (secret/restricted data/declassified), p. 112.
- 55 (40) *"We care about neutrons!"*: Ibid.
- 56 (40) *"precision devices"*: For Kistiakowsky's thinking about how to create a symmetrical implosion, see George B. Kistiakowsky, "Reminiscences of Wartime Los Alamos," in Lawrence Badash, Joseph O. Hirschfelder, and Herbert P. Broida, eds., *Reminiscences of Los Alamos, 1943–1945* (Boston: D. Reidel Publishing, 1980), pp. 49–65. The reference to precision devices appears on page 54.
- 56 (41) *the exploding-bridgewire detonator*: For the story behind the invention of this revolutionary new detonator, see Luis W. Alvarez, *Alvarez: Adventures of a Physicist* (New York: Basic Books, 1987), pp. 132–36. For a brief overview of the technology, see Ron Varesh, "Electric Detonators: Electric Bridgewire Detonators and Exploding Foil Initiators," *Propellants, Explosives, Pyrotechnics*, vol. 21 (1996), pp. 150–54.
- 58 (43) *Hornig was instructed to "babysit the bomb"*: Cited in Donald Hornig and Robert Cahn, "Atom-Bomb Scientist Tells His Story," *Christian Science Monitor*, July 11, 1995. For more details of that night atop the tower, see also "60th Anniversary of Trinity: First Manmade Nuclear Explosion, July 16, 1945," Public Symposium, National Academy of Sciences, July 14, 2005, pp. 27–28; and "Babysitting the Bomb: Interview with Don Hornig," in Kelly, *Manhattan Project*, pp. 298–99.

- 59 (43) *This is what the end of the world will look like*: See James G. Hershberg, *James B. Conant: Harvard to Hiroshima and the Making of the Nuclear Age* (Stanford, CA: Stanford University Press, 1993), p. 234.
- 59 (43) [*Weisskopf*] *thought that his calculations were wrong*: See Brain, *Voice of Genius*, p. 75.
- 59 (43) *“The hills were bathed in brilliant light”*: See O. R. Frisch, “Eyewitness Account of ‘Trinity’ Test, July 1945,” in Philip L. Cantelon, Richard G. Hewlett, and Robert C. Williams, eds., *The American Atom: A Documentary History of Nuclear Policies from the Discovery of Fission to the Present* (Philadelphia: University of Pennsylvania Press, 1992), p. 50.
- 59 (44) *“The whole country was lighted by a searing light”*: Quoted in “Appendix 6. War Department Release on New Mexico Test, July 16, 1945,” in Henry DeWolf Smyth, *Atomic Energy for Military Purposes, 1940–1945: The Official Report on the Development of the Atomic Bomb Under the Auspices of the United States Government* (Princeton, NJ: Princeton University Press, 1945), p. 254.
- 60 (44) *“Now we are all sons of bitches”*: Bainbridge was disturbed by the immense explosion—but also exhilarated and relieved. Had the nuclear device failed to detonate, he would have been the first person to climb the tower and investigate what had gone wrong. See Kenneth T. Bainbridge, “A Foul and Awesome Display,” *Bulletin of the Atomic Scientist* (May 1975), pp. 40–46. The “sons of bitches” line appears on page 46.
- 60 (44) *the “inhuman barbarism” of aerial attacks*: The full text of Franklin Roosevelt’s statement can be found in Bertram D. Hulen, “Roosevelt in Plea; Message to Russia, Also Sent to Finns, Decries ‘Ruthless Bombing,’” *New York Times*, December 1, 1939.
- 60 (44) *attacked the Spanish city of Guernica, killing a few hundred civilians*: The Basque government claimed that almost one third of the city’s five thousand inhabitants were killed by the attack. The actual number was mostly likely two to three hundred. But most of Guernica’s buildings were destroyed, and the aim of the attack was to terrorize civilians. See Jörg Diehl, “Hitler’s Destruction of Guernica: Practicing Blitzkrieg in Basque Country,” *Der Spiegel*, April 26, 2007.

- 60 (44) *bombed and invaded ... Nanking ... killing many thousands*: More than seventy-five years later, the number of people killed in Nanking remains a controversial subject. Chinese scholars now assert that between three and four hundred thousand civilians were massacred, while Japanese nationalists claim that those estimates are absurd and that no war crimes were committed. For a fine, aptly titled introduction to the controversy, see Bob Todashi Wakabayashi, “The Messiness of Historical Reality,” in Bob Tadashi Wakabayashi, ed., *The Nanking Atrocity: Complicating the Picture* (New York: Berghahn Books, 2007), pp. 3–28.
- 60 (44) *“The ruthless bombing from the air”*: Quoted in Hulen, “Roosevelt in Plea.”
- 61 (45) *“The immediate aim is, therefore, twofold”*: Quoted in Richard R. Muller, “The Orgins of MAD: A Short History of City-Busting,” in Henry D. Sokolski, ed., *Getting MAD: Nuclear Mutual Assured Destruction, Its Origins and Practice* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2004), p. 34.
- 61 (45) *The first “firestorm”*: The historian Jörg Friedrich has written a masterful account of the British effort to destroy Germany with fire. His chapters on the weaponry and the strategies used to kill civilians are especially haunting. For the destruction of Hamburg and the desire to create firestorms, see Jorg Friedrich, *The Fire: The Bombing of Germany, 1940–1945* (New York: Columbia University Press, 2006), pp. 90–100; and another fine, unsettling book—Keith Lowe, *Inferno: The Fiery Destruction of Hamburg* (New York: Scribner, 2007).
- 61 (45) *killed about forty thousand*: Cited in Lowe, *Inferno*, p. 276.
- 61 (45) *attack on Dresden, where perhaps twenty thousand civilians died*: Long a source of debate, estimates of the death toll in Dresden have ranged from about thirty-five thousand to about half a million. In 2008 a panel of historians concluded the actual number was between eighteen and twenty-five thousand. Cited in Kate Connolly, “International Panel Rethinks Death Toll from Dresden Raids,” *Guardian* (London), October 3, 2008.
- 61 (45) *“de-housing”*: Quoted in Sokolski, *Getting MAD*, p. 34.
- 61 (45) *daytime “precision” bombing*: The American bombing strategy, inspired by the futility of trench warfare during the First World War, sought to avoid unnecessary casualties and to destroy only military targets—a goal more

- easily achieved in theory than in reality. For the high-minded motives behind the strategy, see Mark Clodfelter, *Beneficial Bombing: The Progressive Foundations of American Air Power, 1917–1945* (Lincoln: University of Nebraska Press, 2010), pp. 1–66.
- 61 (45) *the Norden bombsight*: For a fascinating account of this “technological wonder,” a top secret invention that cost a fortune and never fulfilled the lofty aims of its inventor, see Stephen L. McFarland, *America’s Pursuit of Precision Bombing, 1910–1945* (Tuscaloosa: University of Alabama Press, 1995).
- 62 (46) *forced as many as two hundred thousand Korean women*: The number of Korean women used as sex slaves by the Japanese will never be precisely known. Like the number of Chinese civilians killed in Nanking, it has long been a source of controversy, with Japanese nationalists claiming the actual figure was low. Two hundred thousand is a widely used estimate. For a fine discussion of the issue, see You-me Park, “Compensation to Fit the Crime: Conceptualizing a Just Paradigm of Reparation for Korean ‘Comfort Women,’ ” *Comparative Studies of South Asia, Africa, and the Middle East*, Vol. 30, No. 2, 2010, pp. 204–13. The estimate is cited on page 206.
- 62 (46) *killed almost one million Chinese civilians with chemical and biological weapons*: The number of Chinese killed by such weapons will never be known. According to the historian Daqing Yang, during the two weeks between Japan’s surrender and the arrival of the first American occupying troops, Japanese officials “systematically destroyed sensitive documents to a degree perhaps unprecedented in history.” Nevertheless, it has been conclusively established that the Japanese attacked Chinese civilians with weapons containing mustard gas, anthrax, plague, typhoid, cholera, and bacterial dysentery. See Daqing Yang, “Documentary Evidence and Studies of Japanese War Crimes: An Interim Assessment,” in Edward Drea, Greg Bradsher, Robert Hanyok, James Lide, Michael Petersen, and Daqing Yang, *Researching Japanese War Crime Records: Introductory Essays* (Washington D.C.: Nazi War Crimes and Japanese Imperial Government Records Interagency Working Group, U.S. National Archives, 2006), pp. 21–56; and Till Bärnighausen, “Data Generated in Japan’s Biowarfare Experiments on Human Victims in China, 1932–1945, and the Ethics of

Using Them,” in Jin Bao Nie, Nanyan Guo, Mark Selden, and Arthur Kleinman, eds., *Japan’s Wartime Medical Atrocities: Comparative Inquiries in Science, History, and Ethics* (New York: Routledge, 2010), pp. 81–106.

- 62 (46) *killed millions of other civilians*: The number of people killed by the Japanese throughout Asia will never be known. Over the years, the estimates of civilian deaths in China alone have ranged from ten to thirty-five million. Although those estimates were made by the Chinese government, they suggest the possible scale of the slaughter. Cited in Wakabayashi, *The Nanking Atrocity*, pp. 4, 8.
- 62 (46) *the Army Air Forces tried a new approach* : For the decision to abandon precision bombing and firebomb Tokyo, see Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II, Vol. 5, The Pacific: Matterhorn to Nagasaki, June 1944 to August 1945* (Washington, D.C.: Office of Air Force History, 1983), pp. 608–18; William W. Ralph, “Improvised Destruction: Arnold, LeMay, and the Firebombing of Japan,” *War in History*, vol. 13, no. 4, (2006), pp. 495– 522; and Thomas R. Searle, “‘It Made a Lot of Sense to Kill Skilled Workers’: The Firebombing of Tokyo in March 1945,” *Journal of Military History*, vol. 66, no. 1 (January 2002), pp. 103–33.
- 62 (46) *struck Tokyo with two thousand tons of bombs*: Cited in Craven and Cate, *Army Air Forces in World War II*, p. 615.
- 62 (46) *killed about one hundred thousand civilians*: That number is most likely too low, but the actual figure will never be known. Cited in Ralph, “Improvised Destruction,” p. 495.
- 62 (46) *left about a million homeless*: Cited in Craven and Cate, *Army Air Forces in World War II*, p. 617.
- 62 (46) “*war without mercy*”: See John W. Dower, *War Without Mercy: Race and Power in the Pacific War* (New York: Pantheon, 1987).
- 62 (46) *About one quarter of Osaka was destroyed by fire*: For the proportions of devastation in Japan’s six major industrial cities, see Craven and Cate, *Army Air Forces in World War II*, p. 643.

- 62 (46) *the portion of Toyoma still standing*: The official Army Air Forces history called the amount of destruction in Toyoma “the fantastic figure of 99.5 percent.” Ibid., p. 657.
- 63 (47) *“an appropriately selected uninhabited area”*: Quoted in Kort, *Columbia Guide to Hiroshima*, p. 200.
- 63 (47) *“this new means of indiscriminate destruction”*: Ibid.
- 63 (47) *“to make a profound psychological impression”*: “Notes of the Interim Committee Meeting, Thursday, 31 May 1945” (top secret/declassified), p. 4; the full document is reproduced in Dennis Merrill, ed., *Documentary History of the Truman Presidency, vol. 1; The Decision to Drop the Atomic Bomb on Japan* (Frederick, MD: University Publications of America, 1996), pp. 22–38.
- 63 (47) *“an era of devastation on an unimaginable scale”*: “A Peitition to the President of the United States,” July 17, 1945; the full document is reproduced in Merrill, *Documentary History of Truman Presidency*, p. 219.
- 63 (47) *“continuous danger of sudden annihilation”*: Ibid.
- 64 (47) *Truman’s decision to use the atomic bomb*: A number of historians, most notably Gar Alperovitz, have argued that President Truman used the atomic bomb against Japan primarily as a means of intimidating the Soviet Union. I do not find the argument convincing. See Gar Alperovitz, *The Decision to Use the Atomic Bomb* (New York: Vintage, 1996).
- 64 (48) *between “500,000 and 1,000,000 American lives”*: Quoted in D. M. Giangreco, “‘A Score of Bloody Okinawas and Iwo Jimas’: President Truman and Casualty Estimates for the Invasion of Japan,” *Pacific Historical Review*, vol. 72, no. 1 (February 2003), p. 107.
- 64 (48) *American casualties would reach half a million*: Ibid., pp. 104–5.
- 64 (48) *more than one third of the American landing force*: The American casualty rate at Okinawa was 35 percent. Cited in Richard B. Frank, *Downfall: The End of the Imperial Japanese Empire* (New York: Penguin, 1999), p. 145.
- 64 (48) *might require 1.8 million American troops*: For Operation Olympic, the invasion of Kyushu, 766,700 troops would be used; for Operation Coronet, the invasion of Honshu 1,026,000. Cited in *ibid.*, p. 136.
- 64 (48) *“an Okinawa from one end of Japan to the other”*: Quoted in *ibid.*, p. 143.

- 64 (48) “Now ... you’ ll believe you’re in a war”: Quoted in Michael D. Pearlman, *Unconditional Surrender, Demobilization, and the Atomic Bomb* (Fort Leavenworth, KS: U.S. Army Command and General Staff College, Combat Studies Institute, 1996), p. 7.
- 66 (49) “the maximum demolition of light structures”: Quoted in Stephen Walker, *Shockwave: Countdown to Hiroshima* (New York: Harper Perennial, 2006), p. 122.
- 66 (49) “We should like to know whether the take-off”: See “Letter from J. R. Oppenheimer to Lt. Col. John Landsdale, Jr., September 20, 1944,” quoted in Chuck Hansen, *The Swords of Armageddon*, vol. 7 (Sunnyvale, CA: Chucklea Publications, 2007), p. 30.
- 66 (49) *The president’s Target Committee decided*: See “Memorandum for: General L. R. Groves, Subject: Summary of Target Committee Meetings on 10 May and 11 May 1945,” May 12, 1945 (top secret/declassified), reproduced in Merrill, *Documentary History of Truman Presidency*, pp. 5–14.
- 66 (49) “No suitable jettisoning ground ... has been found”: Ibid., p. 9.
- 66 (50) *try to remove the cordite charges from the bomb midair*: Ibid.
- 66 (50) “bomb commander and weaponeer”: See Craven and Cate, *Army Air Forces in World War II*, p. 716.
- 67 (50) “a less than optimal performance”: Quoted in Martin J. Sherwin, *A World Destroyed: Hiroshima and Its Legacies* (Stanford, CA: Stanford University Press, 2003), p. 231.
- 67 (50) *Parsons and ... Morris Jeppson, left the cockpit*: See Walker, *Shockwave*, pp. 213–17.
- 68 (51) *leaving about three hundred thousand people in town*: The estimates range from 245,423 to 370,000. See Frank, *Downfall*, p. 285.
- 68 (51) *the temperature reached perhaps 10,000 degrees Fahrenheit*: Estimates of the heat ranged from 3,000 to 9,000 degrees Centigrade—5,432 to 16,232 degrees Fahrenheit. Cited in “The Effects of Atomic Bombs on Hiroshima and Nagasaki”, U.S. Strategic Bombing Survey, June 19, 1946, pp. 31–32.
- 68 (51) *a roiling, bubbling sea of black smoke*: The physicist Harold Agnew, who rode in a plane following the *Enola Gay*, described the blast to me. Agnew filmed the mushroom cloud as it rose into the air and captured the only moving images of the explosion.



- 68 (51) *98.62 percent of the uranium in Little Boy was blown apart:* Interview with Robert Peurifoy.
- 68 (51) *Only 1.38 percent actually fissioned:* Ibid.
- 68 (51) *eighty thousand people were killed in Hiroshima:* According to a study conducted by the U.S. Strategic Bombing Survey right after the destruction of Hiroshima and Nagasaki, the “exact number of dead and injured will never be known because of the confusion after the explosions.” The study estimated the dead at Hiroshima to be between 70,000 and 80,000. According to the historian Richard Frank, the police department in Hiroshima prefecture estimated the number to be about 78,000. Many thousands more died, in the months and years that followed. See “The Effects of Atomic Bombs”, p. 15; and Frank, *Downfall*, pp. 285–87.
- 68 (52) *more than two thirds of the buildings were destroyed:* According to Japanese estimates, 62,000 of the 90,000 buildings in Hiroshima were destroyed, about 69 percent. Another 6.6 percent were badly damaged. Cited in “Effects of Atomic Bombs”, p. 9.
- 68 (52) *0.7 grams of uranium-235 were turned into pure energy:* Albert Einstein’s equation for converting the mass of an object into an equivalent amount of energy helps to explain why something so small can produce an explosion so large. The energy that can be released, Einstein found, equals the mass of an object multiplied by the speed of light, squared. Since the speed of light is more than 186,000 miles per second, the equation easily produces enormous sums. The estimate of 0.7 grams is based on the quantity of uranium-235 in Little Boy and an assumption that the bomb’s yield was 15 kilotons. The power of even a rudimentary nuclear weapon is difficult to convey. The city of Hiroshima was destroyed by an amount of uranium-235 about the size of a peppercorn or a single BB. I am grateful to Bob Peurifoy for helping me to understand the relationship between a nuclear weapon’s potential yield and its efficiency.
- 68 (52) *A dollar bill weighs more:* According to the Federal Reserve, a dollar bill weighs 1 gram.
- 69 (52) *“the basic power of the universe”:* See “President Truman’s Statement on the Bombing of Hiroshima, August 6, 1945,” reproduced in Kort, *Columbia Guide to Hiroshima*, p. 230.

- 69 (52) *“We are now prepared to obliterate more rapidly”*: Ibid., p. 231.
- 69 (52) *“an aroused fighting spirit to exterminate”*: Quoted in “Effects of Atomic Bombs”, p. 8.
- 69 (52) *putting it together presented more of a challenge*: A report issued the following year, even though heavily censored, suggests the challenges of using Fat Man safely. One early assembly method proved to be unwise: “the overhead chain hoists were dangerous due to long lengths of chain striking the detonators in the sphere.” “Nuclear Weapons Engineering and Delivery,” Los Alamos Technical Series, vol. 23, LA-1161, July 1946 (secret/declassified), p. 107.
- 69 (52) *“rebuilding an airplane in the field”*: Quoted in Rhodes, *Making of the Atomic Bomb*, p. 590.
- 69 (52) *Bernard J. O’Keefe noticed something wrong*: For the last-minute, late-night repair work on Fat Man, see Bernard J. O’Keefe, *Nuclear Hostages* (Boston: Houghton Mifflin, 1983), pp. 98–101.
- 69 (52) *“I felt a chill and started to sweat”*: Ibid., p. 98.
- 70 (53) *flashing red lights on the flight test box*: For the malfunction en route to Nagasaki, see Charles W. Sweeney with James A. Antonucci, and Marion K. Antonucci. *War’s End: An Eyewitness Account of America’s Last Atomic Mission* (New York: Avon, 1997), p. 209–10.
- 70 (53) *About one fifth of the plutonium fissioned*: Peurifoy interview.
- 70 (53–54) *equal to about 21,000 tons of TNT*: The precise yields of the atomic bombs used at Hiroshima and Nagasaki were the subject of disagreement for many years. The rudimentary nature of the measuring equipment and poor documentation of the missions by the United States Army Air Forces created the uncertainty. Estimates of the Hiroshima bomb’s explosive force ranged from 6 kilotons to 23 kilotons. According to the most recent study at Los Alamos, the yield of the Hiroshima bomb was 15 kilotons, with a 20 percent margin of error. The yield of the Nagasaki bomb was 21 kilotons, with a 10 percent margin of error. See John Malik, “The Yields of the Hiroshima and Nagasaki Nuclear Explosions,” Los Alamos National Laboratory, LA-8819, September 1985.
- 71 (54) *About forty thousand people were killed ... at least twice that number were injured*: In 1946 the United States Strategic Bombing Survey estimated the

- number of deaths in Nagasaki to be more than thirty-five thousand; the following year it raised the estimate to forty-five thousand. The actual number is likely to be much higher and will never be known. See “Effects of Atomic Bombs”, p. 15; and Frank, *Downfall*, pp. 285–87.
- 71 (54) *more than one third of the homes were destroyed*: Of the 52,000 residential units in Nagasaki, 27.2 percent were completely destroyed and 10.5 percent were half burned or destroyed. Cited in “Effects of Atomic Bombs”, p. 13.
- 71 (54) *“bent and twisted like jelly”*: The Nagasaki Prefecture Report on the blast is quoted in *ibid.*
- 71 (54) *Most of the casualties in Hiroshima and Nagasaki*: The proportions of various causes of death are speculative. As the U.S. Strategic Bombing Survey noted, “Many of these people undoubtedly died several times over, theoretically, since each was subjected to several injuries, any of which would have been fatal.” Nevertheless, an attempt was made to calculate how many people were killed by the different blast effects. *Ibid.*, p. 15.
- 71 (54) *Flash burns were caused by extraordinarily hot*: For the impact of thermal radiation on human beings, see Glasstone, *Effects of Nuclear Weapons*, pp. 565–76.
- 71 (54) *“radiation sickness”*: For the grim symptoms and survival rate of this ailment, *ibid.*, pp. 577–626.
- 72 (55) *For decades some historians have questioned*: As Michael Kort has noted, the historiographic debate has focused on a number of questions, including: Was Japan already planning to surrender before the destruction of Hiroshima? How much did the United States know about the Japanese leadership’s plans? Was the demand for an unconditional surrender unreasonable? Were the casualty estimates for an American invasion accurate? Did the Soviet declaration of war on Japan—or the two atomic bombs—prompt Emperor Hirohito to accept defeat? Kort’s analysis can be found in *Columbia Guide to Hiroshima*, pp. 75–116. For the argument that the Soviet entry into the war proved decisive, see Tsuyoshi Hasegawa, *Racing the Enemy: Stalin, Truman, and the Surrender of Japan* (Cambridge, MA: Belknap Press, 2005). For the argument that the atomic bombs ended the war, see Sadao Asada, “The Shock of the Atomic Bomb and Japan’s Decision to Surrender: A Reconsideration,” *Pacific Historical Review*, vol.

67, no. 4, (November 1998), pp. 477–512. For the American military’s concern that more atomic bombs might have to be used in Japan, see Barton J. Bernstein, “Eclipsed by Hiroshima and Nagasaki: Early Thinking About Tactical Nuclear Weapons,” *International Security*, vol. 15, no. 4, (Spring 1991), pp. 149–73. For a thorough and complex look at these issues, see Frank, *Downfall*, pp. 197–364.

- 72 (55) “*even though we have to eat grass*”: The quote comes from “Instruction to the Troops,” a radio broadcast by General Anami. The full text can be found in Kort, *Columbia Guide to Hiroshima*, pp. 300–301.
- 72 (55) “*The enemy has for the first time used cruel bombs*”: Quoted in John W. Dower, *Embracing Defeat: Japan in the Wake of World War II* (New York: W. W. Norton, 2000), p. 36.

## POTENTIELLE GEFAHREN

- 73 (57) “*fire in the hole*”: “Report, Major Missile Accident, Titan II Complex 374-7,” Statement of Eric Ayala, Airman First class, Tab U-4, p. 2.
- 76 (59) “*Can my people come back into the control center?*”: Quoted in *ibid.*, Statement of Allan D. Childers, First Lieutenant, Tab U-13, p. 2.
- 76 (59) “*There’s got to be a malfunction*”: *Ibid.*
- 76 (59) “*Well, get over here*”: *Ibid.*
- 77 (60) “*Holy shit*,” *thought Holder*: Holder interview.
- 78 (60) *Sid King was having dinner at a friend’s house*: Interview with Sid King.
- 79 (62) *an oxidizer trailer parked on the hardstand had started to leak*: My account of the oxidizer leak is based on interviews with Jeff Kennedy, who was a PTS technician in Little Rock at the time; Gus Anglin, the sheriff who responded to the leak; and Bill Carter, the attorney who represented a local farmer sickened by the fumes. See also Art Harris, “Titan II: A Plague on This Man’s House,” *Washington Post*, September 22, 1980.
- 80 (62) *Gus Anglin, the sheriff of Van Buren County, was standing with a state trooper*: Anglin interview.
- 81 (63) “*I’m the sheriff of the county*”: *Ibid.*
- 81 (63) “*No, no, we’ve got everything under control*”: Quoted in *ibid.*

- 81 (64) *“Sir, get your ass out of here”*: Quoted in King interview.
- 82 (64) *“Boy, he wasn’t in too good a mood”*: Quoted in *ibid.*
- 82 (65) *“green smoke”*: Quoted in “Report, Major Missile Accident, Titan II Complex 374-7,” Childers statement, Tab U-13, p. 3.
- 86 (67) *“If the missile blows,” Holder said*: Holder interview.
- 86 (68) *designed to withstand a nuclear detonation with an overpressure of 300 psi*: Cited in Stumpf, *Titan II*, p. 101.
- 86 (68) *survive an overpressure of 1,130 psi*: Cited in *ibid.*, p. 118.
- 88 (69) *“Put him in the middle of you guys”*: “Report, Major Missile Accident, Titan II Complex 374-7,” Childers statement, Tab U-13, p. 4.
- 89 (70) *“You’ve got to be kidding me,” Holder thought*: Holder interview.
- 89 (70) *“Get out of here, get out of here”*: “Report, Major Missile Accident, Titan II Complex 374-7,” Statement of Thomas A. Brocksmith, Technical Sergeant, Tab U-9, p. 1.

## ZWEITER TEIL: KONTROLLMECHANISMEN

### DIE BESTEN, DIE GRÖSSTEN UND DIE MEISTEN

- 92 (73) *Hamilton Holt’s dream of world peace*: See Warren F. Kuehl, *Hamilton Holt: Journalist, Internationalist, Educator* (Gainesville: University of Florida Press, 1960).
- 92 (73) *“pause, passer-by, and hang your head”*: Holt’s inscription continues: “This engine of destruction, torture, and death symbolizes the prostitution of the inventor, the avarice of the manufacturer, the blood-guilt of the statesman, the savagery of the soldier, the perverted patriotism of the citizen, the debasement of the human race ...” The peace monument was vandalized and destroyed in 1943.
- 92 (74) *About fifty million people had been killed*: The actual number will never be known. I have chosen to use a conservative estimate. See Martin Gilbert, *The Second World War: A Complete History* (New York: Holt Paperbacks, 2004), p. 1.

- 93 (74)            “*destructive beyond the wildest nightmares*”: See “General Arnold Stresses Preparedness Need in Statement,” *Washington Post*, August 19, 1945.
- 93 (74)            “*Seldom if ever has a war ended*”: Quoted in Paul Boyer, *By the Bomb’s Early Light: American Thought and Culture at the Dawn of the Atomic Age* (Chapel Hill: University of North Carolina Press, 1994), p. 7. The full text of Murrow’s broadcast can be found in Edward Bliss, Jr., ed., *In Search of Light, 1938–1961: The Broadcasts of Edward R. Murrow* (New York: Alfred A. Knopf, 1967), pp. 102–3. “No one is trying to assess the relative influence of the atomic bomb and the Russian declaration of war in bringing about the Japanese defeat,” Murrow added, less than a week after Hiroshima’s destruction. “People are content to leave that argument to the historians.” 93 (74)            *The appeal called for the United Nations’ General Assembly*: See George C. Holt, “The Conference on World Government,” *Journal of Higher Education*, vol. 17, no. 5 (May 1946), pp. 227–35.
- 93 (74)            “*We believe these to be the minimum requirements*”: Quoted in *ibid.*, p. 234.
- 94 (75)            “*a world government with power to control*”: Quoted in Boyer, *Bomb’s Early Light*, p. 37.
- 94 (75)            *lowered “the cost of destruction*”: H. H. Arnold, “Air Force in the Atomic Age,” in Dexter Masters and Katharine Way, eds., *One World or None: A Report to the Public on the Full Meaning of the Atomic Bomb* (New York: New Press, 2007), p. 71.
- 94 (75)            “*too cheap and easy*”: *Ibid.*, p. 70.
- 94 (75)            “*A far better protection*”: *Ibid.*, p. 84.
- 94 (75)            *atom bomb’s “very existence should make war unthinkable*”: “Memorandum by the Commanding General, Manhattan Engineer District, Leslie R. Groves: Our Army of the Future—As Influenced by Atomic Weapons” (confidential/declassified), in United States Department of State, *Foreign Relations of the United States, 1946, vol. 1, General; the United Nations* (Washington, D.C.: U.S. Government Printing Office, 1972), p. 1199.
- 94 (75)            “*If there are to be atomic bombs in the world*”: *Ibid.*, p. 1203 95 (76) “*a secret armament race of a rather desperate character*”: Henry L. Stimson,

- “Memorandum for the President, Subject: Proposed Action for the Control of Atomic Bombs,” September 11, 1945 (top secret/declassified), reproduced in Merrill, *Documentary History of Truman Presidency*, p. 222.
- 95 (76) “*The only way you can make a man trustworthy*”: Ibid., p. 224.
- 95 (76) “*We tried that once with Hitler*”: Quoted in Walter Millis and E. S. Duffield, eds., *The Forrestal Diaries* (New York: Viking, 1951), p. 96.
- 95 (76) “*There is nothing—I repeat nothing*”: “The Charge in the Soviet Union (Kennan) to the Secretary of State,” Moscow, September 30, 1945, in United States State Department, *Foreign Relations of the United States: Diplomatic Papers, 1945, vol. 5, Europe* (Washington, D.C.: U.S. Government Printing Office, 1967), p. 885.
- 96 (76) “*highly dangerous*”: Ibid.
- 96 (77) *executed tens of thousands of their citizens*: Within a year of invading Poland during the fall of 1939, the Soviets imprisoned and executed more than twenty thousand Polish officers, policemen, and civilians. And then the Soviet Union denied that fact for more than fifty years. See Anna M. Cienciala, Natalia S. Lebedeva, Wojciech Materski, eds., *Katyn: A Crime Without Punishment* (New Haven, CT: Yale University Press, 2008).
- 96 (77) *the deaths of perhaps three hundred thousand Japanese*: See Frank, *Downfall*, pp. 325–26.
- 96 (77) *killed almost as many Russians as the Nazis had*: The actual number killed by Hitler and Stalin remains a subject of debate. Both men were responsible for many millions of deaths. Dmitri Volkogonov, a scholar who gained access to Soviet archives, claimed that Stalin killed about twelve million Russians—not including those who died during the Second World War. According to the historian Timothy Snyder, the Nazis deliberately killed about twelve million civilians, while the Soviets killed about nine million during Stalin’s years in power. The historian Anne Applebaum has argued that Snyder’s estimates for Stalin seem too low, noting “Soviet citizens were just as likely to die during the war years because of decisions made by Stalin, or because of the interaction between Stalin and Hitler, as they were from the commands of Hitler alone.” See Dmitri Volkogonov, *Stalin: Triumph and Tragedy* (New York: Grove Weidenfeld, 1988), p. 524; Anne Applebaum, “The Worst of the Madness,” *New York Review of Books*,

- November 11, 2010; and Timothy Snyder, “Hitler vs. Stalin: Who Killed More?,” *New York Review of Books*, March 10, 2011.
- 97 (78) “*a militaristic oligarchy*”: Quoted in Peter Douglas Feaver, *Guarding the Guardians: Civilian Control of Nuclear Weapons in the United States* (Ithaca, NY: Cornell University Press, 1992), p. 100.
- 98 (78) *The president was given the sole authority*: The historian Garry Wills has argued that the decision to give this unchecked power to the executive branch had a lasting and profound effect on American democracy. See Garry Wills, *Bomb Power: The Modern Presidency and the National Security State* (New York: Penguin Press, 2010). For the constitutional and legal basis for such power, see Frank Klotz, Jr., “The President and the Control of Nuclear Weapons,” in David C. Kozak and Kenneth N. Ciboski, eds., *The American Presidency: A Policy Perspective from Readings and Documents* (Chicago: Nelson-Hall, 1987), pp. 47–58.
- 98 (79) “*We are here to make a choice*”: For the full text of Bernard Baruch’s remarks, see “Baruch Reviews Portent of A-Bomb,” *Washington Post*, June 15, 1946.
- 98 (79) “*all atomic-energy activities potentially dangerous*”: Ibid.
- 99 (79) *willing to hand over its “winning weapons”*: Ibid.
- 99 (80) *The number of soldiers in the U.S. Army*: In August 1945 the Army had more than 8 million soldiers and by July 1, 1947, it had only 989,664—a remarkably swift dismantling of a victorious military force. See John C. Sparrow, *History of Personnel Demobilization in the United States Army* (Washington, D.C.: Department of the Army, 1952), pp. 139, 263.
- 99 (80) *from almost 80,000 to fewer than 25,000*: See Bernard C. Nalty, ed., *Winged Shield, Winged Sword: A History of the United States Air Force, vol. 1, 1907–1950* (Washington, D.C.: Air Force History and Museums Program, 1997), p. 378.
- 99 (80) *only one fifth of those planes*: Ibid.
- 99 (80) *the defense budget was cut by almost 90 percent*: The United States spent about \$83 billion on defense in 1945—and about \$9 billion in 1948. Cited in “National Defense Budget Estimates for FYH 2013,” Office of the Under Secretary of Defense (Comptroller), March 2012, p. 246.



- 100 (80) *“No major strategic threat or requirement”*: Quoted in Walton S. Moody, *Building a Strategic Air Force* (Washington, D.C.: Air Force History and Museums Program, 1995), p. 78.
- 100 (80) *the Soviets were “fanatically” committed to destroying*: Kennan’s quotes come from his famous “long telegram,” whose full text can be found at “The Charge in the Soviet Union (Kennan) to the Secretary of State,” February 22, 1946 (secret/declassified), in United States State Department, *Foreign Relations of the United States: 1946, vol. 6, Eastern Europe; The Soviet Union* (Washington, D.C.: U.S. Government Printing Office, 1969), pp. 696–709.
- 100 (80) *an “iron curtain”*: For the speech in which Churchill first used that phrase, see “Text of Churchill’s Address at Westminster College,” *Washington Post*, March 6, 1946.
- 100 (80–81) *“terror and oppression, a controlled press and radio”*: For Truman’s speech, see “Text of President’s Speech on New Foreign Policy,” *New York Times*, March 13, 1947.
- 101 (81) *the Pentagon did not have a war plan*: The first major study of potential targets in the Soviet Union was conducted in the summer of 1947. For America’s lack of war plans, see L. Wainstein, C. D. Creamans, J. K. Moriarity, and J. Ponturo, “The Evolution of U.S. Strategic Command and Control and Warning, 1945–1972,” Institute for Defense Analyses, Study S-467, June 1975 (top secret/restricted data/declassified), pp. 11–14; Ernest R. May, John D. Steinbruner, and Thomas W. Wolfe, “History of the Strategic Arms Competition, 1945–1972,” Pt. 1, Office of the Secretary of Defense, Historical Office, March 1981 (top secret/restricted data/declassified), pp. 21–22; and James F. Schnabel, *The Joint Chiefs of Staff and National Policy; vol. 1, 1945–1947* (Washington, D.C.: Office of Joint History, Office of the Chairman of Joint Chiefs of Staff, 1996), pp. 70–75.
- 101 (81) *The U.S. Army had only one division ... along with ten police regiments*: Cited in Steven T. Ross, *American War Plans, 1945–1950: Strategies for Defeating the Soviet Union* (Portland, OR: Frank Cass, 1996), p. 40.
- 101 (81) *for a total of perhaps 100,000 troops*: In May 1945 the United States had about 2 million troops in Europe; two years later it had 105,000. Cited in “History Timeline,” United States Army Europe, U.S. Army, 2011.

- 101 (81) *The British army had one division*: Cited in Ross, *War Plans*, p. 40.
- 101 (81) *the Soviet army had about one hundred divisions*: See Schnabel, *Joint Chiefs of Staff*, vol. 1, p. 71.
- 101 (81) *about 1.2 million troops*: Cited in Ross, *War Plans*, p. 53.
- 101 (81) *more than 150 additional divisions*: Cited in *ibid.*, p. 33. Some intelligence reports claimed that the Soviet Union had 175 divisions in Europe, with 40 of them ready to attack West Germany. The Pentagon estimates of Soviet troop numbers varied widely—and, according to the historian Matthew A. Evangelista, deliberately overstated the strength of the Red Army. A more innocent motive might have been a desire to prepare for the worst. In any event, by early 1947, the U.S. Army was greatly outnumbered in Europe. See May et al., “History of Strategic Arms Competition,” *pt.1* pp. 37, 139–41; and Matthew A. Evangelista, “Stalin’s Postwar Army Reappraised,” *International Security*, vol. 7, no. 3 (1982), pp. 110–38.
- 101 (81) *the Bikini atoll in the Marshall Islands*: For a patriotic account of the test, which somehow inspired the name for a woman’s two-piece bathing suit, see W. A. Shurcliff, *Bombs at Bikini: The Official Report of Operation Crossroads* (New York: Wm. H. Wise, 1947).
- 101 (81) *“Ships at sea and bodies of troops”*: “The Evaluation of the Atomic Bomb as a Military Weapon,” Enclosure “A,” The Final Report of the Joint Chiefs of Staff Evaluation Board for Operation Crossroads June 30 1941 (top secret/declassified), p. 12.
- 102 (81–82) *“The bomb is pre-eminently a weapon”*: *Ibid.*, p. 32.
- 102 (82) *“man’s primordial fears”*: *Ibid.*, p. 36.
- 102 (82) *“break the will of nations”*: *Ibid.*
- 102 (82) *“cities of especial sentimental significance”*: *Ibid.*, p. 37.
- 102 (82) *if “we were ruthlessly realistic”*: Quoted in Marc Trachtenberg, *History & Strategy* (Princeton, NJ: Princeton University Press, 1991), p. 100.
- 102 (82) *“I don’t advocate preventive war”*: Quoted in “The Five Nests,” *Time*, September 11, 1950, p. 24.
- 102 (82) *“I think I could explain to Him”*: Quoted in *ibid.*
- 102 (82) *Support for a first strike extended far beyond the upper ranks of the U.S. military*: Marc Trachtenberg offers a fine summary of American thinking about “preventive war” in *History & Strategy*, pp. 103–7. For other views of

- the subject, see Russell D. Buhite and W. Christopher Hamel, “War for Peace: The Question of an American Preventive War Against the Soviet Union, 1945–1955,” *Diplomatic History*, vol. 14, no. 3, (1990), pp. 367–84; and Gian P. Gentile, “Planning for Preventive War,” *Joint Force Quarterly*, Spring 2000, pp. 68–74.
- 103 (82) *Russell ... urged the western democracies to attack*: Bertrand Russell and his admirers later denied that he’d ever called for such an attack. But his rejection of pacifism, when dealing with the Soviets, had already been made clear. See “Russell Urges West to Fight Russia Now,” *New York Times*, November 21, 1948; Bertrand Russell, “The Atomic Bomb and the Prevention of War,” *Bulletin of the Atomic Scientists* (October 1, 1946), pp. 19–21; and Ray Perkins, “Bertrand Russell and Preventive War,” *Russell: The Journal of Bertrand Russell Studies*, vol. 14, no. 2 (1994), pp. 135–53.
- 103 (82) *“anything is better than submission”*: Quoted in *New York Times*, “Russell Urges West to Fight.” 103 (82) *Winston Churchill agreed*: See Trachtenberg, *History & Strategy*, p. 105.
- 103 (82) *Even Hamilton Holt, lover of peace*: See Kuehl, *Hamilton Holt*, pp. 250–51.
- 103 (83) *“should be wiped off the face of the earth”*: Quoted in *ibid.*, p. 250.
- 103 (83) *the Joint Chiefs of Staff approved HALFMOON*: For an abridged version of HALFMOON, see “Brief of Short Range Emergency War Plan (HALFMOON),” JCS 1844/13, July 21, 1948 (top secret/declassified), in Thomas H. Etzold and John Lewis Gaddis, *Containment: Documents on American Policy and Strategy, 1945–1950* (New York: Columbia University Press, 1978), pp. 315–24. For additional details, see May et al., “History of Strategic Arms Competition,” pt. 1, pp. 38–39; Ross, *War Plans*, pp. 79–97; and Kenneth W. Condit, *The Joint Chiefs of Staff and National Policy*, vol. 2, 1947–1949 (Washington, D.C.: Office of Joint History, Office of the Chairman of Joint Chiefs of Staff, 1996), pp. 156–58.
- 103 (83) *an “atomic blitz”*: See “Conceptual Developments: The Atomic Blitz,” in Wainstein et al., “Evolution of U.S. Command and Control,” pp. 11–16.
- 103 (83) *Leningrad was to be hit by 7 atomic bombs, Moscow by 8*: Cited in Condit, *Joint Chiefs of Staff*, vol. 2, p. 158.
- 104 (83) *“the nation-killing concept”*: Quoted in Wainstein et al., “Evolution of U.S. Command and Control,” p. 15.

- 104 (83) *“a nation would die just as surely”*: Quoted in Robert F. Futrell, *Ideas, Concepts, Doctrine, vol. 1, Basic Thinking in the United States Air Force, 1907–1960* (Maxwell Air Force Base, AL: Air University Press, 1989), p. 240.
- 104 (83) *a “devastating, annihilating attack”*: Quoted in Jeffrey G. Barlow, *Revolt of the Admirals: The Fight for Naval Aviation, 1945–1950* (Washington, D.C.: Government Reprints Press, 2001), p. 109.
- 104 (83) *“It will be the cheapest thing we ever did”*: Quoted in Moody, *Building a Strategic Air Force*, p. 109.
- 105 (84) *“The negative psycho-social results”*: The State Department official was Charles E. Bohlen, quoted in Futrell, *Ideas*, vol. 1, p. 238.
- 105 (85) *the Harmon Committee concluded*: An abridged version of the Harmon Report—“Evaluation of Effect on Soviet War Effort Resulting from the Strategic Air Offensive” (top secret/ declassified)—can be found in Etzold and Gaddis, *Containment*, pp. 360–64.
- 105 (85) *reduce Soviet industrial production by 30 to 40 percent*: Ibid., p. 361.
- 105 (85) *kill perhaps 2.7 million civilians*: Ibid., p. 362.
- 105 (85) *injure an additional 4 million*: Ibid.
- 106 (85) *“For the majority of Soviet people”*: Ibid.
- 106 (85) *“the only means of rapidly inflicting shock”*: Ibid., pp. 363–64.
- 106 (85) *The Sowjets detonated their first atomic device*: For the making of the Soviet bomb, see *ibid.* David Holloway, *Stalin and the Bomb: The Soviet Union and Atomic Energy, 1939–1956* (New Haven, CT: Yale University Press, 1994).
- 106 (85) *The yield was about 20 kilotons*: Cited in *ibid.*, p. 218.
- 106 (86) *Each of its roughly 105,000 parts*: For the extraordinary story of how the B-29 was reverseengineered, see Van Hardesty, “Made in the U.S.S.R.,” *Air & Space*, March 2001; and Walter J. Boyne, “Carbon Copy,” *Air Force Magazine*, June 2009.
- 107 (86) *Soviet Union wouldn’t develop an atomic bomb until the late 1960s*: In 1947, General Groves predicted it would take the Soviets another twenty years. See Gregg Herken, “‘A Most Deadly Illusion’: The Atomic Secret and American Nuclear Weapons Policy, 1945–1950,” *Pacific Historical Review*, vol. 49, no. 1 (February 1980), pp. 58, 71.

- 107 (86) *without a single military radar to search for enemy planes*: See Wainstein et al., “Evolution of U.S. Command and Control,” p. 90.
- 107 (86) *twenty-three radars to guard the northeastern United States*: Cited in *ibid.*, p. 94.
- 107 (86) *a bitter, public dispute about America’s nuclear strategy*: For an excellent overview of the military thinking that led not only to the “revolt of the admirals” but also to Pentagon support for a hydrogen bomb, see David Alan Rosenberg, “American Atomic Strategy and the Hydrogen Bomb Decision,” *Journal of American History*, vol. 66, no. 1 (June 1979), pp. 62–87. For the cultural underpinnings of the revolt, see Vincent Davis, *The Admirals Lobby* (Chapel Hill: University of North Carolina Press, 1967). And for the dispute itself, see Barlow, *Revolt of the Admirals*, p. 109.
- 107 (87) *“precision” tactical bombing*: See John G. Norris, “Radford Statement Sparks Move for Curb Over Money Powers of Johnson,” *Washington Post*, October 8, 1949.
- 108 (87) *“I don’t believe in mass killings of noncombatants”*: Quoted in *Ibid.*
- 108 (87) *“random mass slaughter”*: See “Text of Admiral Ofstie’s Statement Assailing Strategic Bombing,” *New York Times*, October 12, 1949.
- 108 (87) *“ruthless and barbaric”*: *Ibid.*
- 108 (87) *“We must insure that our military techniques”*: *Ibid.*
- 108 (87) *“open rebellion”*: Quoted in William S. White, “Bradley Accuses Admirals of ‘Open Rebellion’ on Unity; Asks ‘All-American Team,’” *New York Times*, October 20, 1949.
- 108 (87) *“Fancy Dans”*: Quoted in *ibid.*
- 108 (87) *“aspiring martyrs”*: Quoted in Hanson W. Baldwin, “Bradley Bombs Navy,” *New York Times*, October 20, 1949.
- 109 (87) *“As far as I am concerned”*: Quoted in *New York Times*, “Bradley Accuses Admirals.”
- 109 (88) *“The idea of turning over custody”*: Quoted in David E. Lilienthal, *The Journals of David E. Lilienthal, vol. 2, The Atomic Energy Years, 1945–1950*, (New York: Harper & Row, 1964), p. 351.
- 109 (88) *“to have some dashing lieutenant colonel decide”*: Quoted in Millis and Duffield, *Forrestal Diaries*, p. 458.

- 109 (88)        *“Destruction is just around the corner”*: Quoted in Futrell, *Ideas*, vol. 1, p. 216.
- 109 (88)        *Demobilization had left SAC a hollow force*: For a book that makes that point convincingly, see Harry R. Borowski, *A Hollow Threat: Strategic Air Power and Containment Before Korea* (Westport, CT: Greenwood Press, 1982).
- 110 (88)        *almost half of SAC’s B-29s failed to get off the ground*: See Thomas M. Coffey, *Iron Eagle: The Turbulent Life of General Curtis LeMay* (New York: Crown, 1986), p. 271.
- 110 (88)        *SAC had just twenty-six flight crews*: Cited in “View from Above: High-Level Decisions and the Sowjet-American Strategic Arms Competition 1945 – 1950”, Samuel R. Williamson, Jr., with collaboration of Steven L. Rearden, Office of the Secretary of Defense, October 1975, (TOP SECRET/declassified) , p. 118.
- 110 (88–89)     *Perhaps half of these crews would be shot down*: Cited in Wainstein et al., “Evolution of U.S. Command and Control,” p. 14.
- 110 (89)        *An estimated thirty-five to forty-five days of preparation*: See *ibid.*, p. 18.
- 111 (89)        *Lindbergh found that morale was low*: See Moody, *Building a Strategic Air Force*, pp. 226–27.
- 111(90)        *“cut off from normal life”*: The quote comes from LeMay’s memoir. Curtis E. LeMay with Mac- Kinlay Kantor, *Mission with LeMay: My Story* (Garden City, NY: Doubleday, 1965), p. 32.
- 112 (91)        *a particular form of courage*: American bomber crews had one of the most stressful and dangerous assignments of the Second World War. Remaining in formation meant flying directly through antiaircraft fire; breaking formation was grounds for court-martial. For the pressures of the job and the need for teamwork, see Mike Worden, *Rise of the Fighter Generals: The Problem of Air Force Leadership, 1945–1982* (Maxwell Air Force Base, AL: Air University Press, 1998), pp. 8–11.
- 113 (91)        *more than half would be killed in action*: The typical tour of duty for an American bomber crew was twenty-five missions. A study of 2,051 crew members who flew bombing missions over Europe found that 1,295 were killed or declared missing in action. The study is cited in Bernard C. Nalty, John F. Shiner, and George M. Watson, *With Courage: The U.S. Army Air*

- Forces in World War II* (Washington, D.C.: Air Force History and Museums Program, 1994), p. 179.
- 114 (91) “*Japan would burn if we could get fire on it*”: The prediction was made by General David A. Burchinal, who flew in one of the early firebomb attacks on Japan. Quoted in Richard H. Kohn and Joseph P. Harahan, eds., *Strategic Air Warfare: An Interview with Generals Curtis E. LeMay, Leon W. Johnson, David A. Burchinal, and Jack J. Catton* (Washington, D.C.: Office of Air Force History, 1988), p. 61.
- 114 (92) “*I’ll tell you what war is about*”: Quoted in Warren Kozak, *LeMay: The Life and Wars of General Curtis LeMay* (Washington, D.C.: Regnery, 2009), p. xi.
- 114 (92) “*We scorched and boiled and baked to death more people*”: Although more Japanese were most likely killed in Hiroshima and Nagasaki than in Tokyo, LeMay’s remark succinctly conveys his view of nuclear weapons. See LeMay, *Mission with LeMay*, p. 387.
- 114 (92) “*about the darkest night in American military aviation history*”: Ibid., p. 433.
- 115 (93) “*I can’t afford to differentiate*”: Quoted in Kohn and Harahan, *Strategic Air Warfare*, p. 98.
- 115 (93) “*Every man a coupling or a tube*”: LeMay, *Mission with LeMay*, p. 496.
- 115 (93) “*we are at war now*”: Ibid., p. 436.
- 115 (93) *San Francisco was bombed more than six hundred times*: Cited in ibid.
- 116 (94) “*a single instrument ... directed, controlled*”: The quote, from an article by air power theorists Colonel Jerry D. Page and Colonel Royal H. Roussel, can be found in Michael H. Armacost, *The Politics of Weapons Innovation: The Thor-Jupiter Controversy* (New York: Columbia University Press, 1969), p. 101.
- 116 (94) *Louis Slotin was tickling the dragon*: For Slotin’s accident and its aftermath, see Stewart Alsop and Ralph E. Lapp, “The Strange Death of Louis Slotin,” in Charles Neider, ed., *Man Against Nature* (New York: Harper & Brothers, 1954), pp. 8–18; Clifford T. Honicker, “America’s Radiation Victims: The Hidden Files,” *New York Times*, November 19, 1989; Richard E. Malenfant, “Lessons Learned from Early Criticality Accidents,” Los Alamos National Laboratory, submitted for Nuclear Criticality Technology Safety Project

Workshop, Gaithersburg, MD, May 14–15, 1996; and Eileen Welsome, *The Plutonium Files: America's Secret Medical Experiments in the Cold War* (New York: Dial Press, 1999), pp. 184–88.

- 117 (95) “Slotin was that safety device”: “Report on May 21 Accident at Pajarito Laboratory,” May 28, 1946, in Los Alamos, “Lessons Learned from Early Criticality Accidents.” 118 (95) *David Lilienthal visited Los Alamos for the first time*: For the disarray at Los Alamos and the absence of atomic bombs, see Richard G. Hewlett and Francis Duncan, *Atomic Shield: A History of the United States Atomic Energy Commission, vol. 2, 1947–1952*, (University Park: Pennsylvania State University Press, 1969), pp. 30, 47–48; May et al., “History of Strategic Arms Competition, pt. 1”, p. 2; Gregg Herken, *The Winning Weapon: The Atomic Bomb in the Cold War 1945–1950* (New York: Vintage, 1982), pp. 196–99; Necah Stewart Furman, *Sandia National Laboratories: The Postwar Decade* (Albuquerque: University of New Mexico Press, 1990), pp. 233–36; and James L. Abrahamson and Paul H. Carew, *Vanguard of American Atomic Deterrence: The Sandia Pioneers, 1946–1949*. (Westport, CT: Praeger, 2002), p. 120.
- 118 (96) “one of the saddest days of my life”: Quoted in Herken, *Winning Weapon*, p. 196.
- 118 (96) “The substantial stockpile of atom bombs”: Quoted in Furman, *Sandia National Laboratories*, p. 235.
- 118 (96) *at most, one*: “Actually, we had one [bomb] that was probably operable when I first went off to Los Alamos: one that had a good chance of being operable,” Lilienthal later told the historian Gregg Herken. Although Los Alamos had perhaps a dozen nuclear cores in storage, a shortage of parts made it impossible to put together that many bombs. Colonel Gilbert M. Dorland, who headed the bomb-assembly battalion at Sandia, had an even bleaker view of the situation than Lilienthal. “President Truman and the State Department were plain bluffing,” Dorland later wrote. “We couldn’t have put a bomb together and used it.” For Lilienthal, see Herken, *Winning Weapon*, p. 197. For Dorland, see Abrahamson and Carew, *Vanguard of Atomic Deterrence*, p. 120.
- 119 (96) “probably operable”: Quoted in Herken, *Winning Weapon*, p. 197.



- 119 (96) “*We not only didn’t have a pile*”: Quoted in *ibid*, p. 235.
- 119 (96) “*haywire contraption*”: Quoted in Hansen, *Swords of Armageddon*, vol. 1, p. 133.
- 119 (96) *Nobody had bothered to save all the technical drawings*: According to the official history of the Atomic Energy Commission, when the original Manhattan Project scientists left Los Alamos, they “left behind them no production lines or printed manuals, but only a few assistants, some experienced technicians, some laboratory equipment, and a fragmented technology recorded in thousands of detailed reports.” See Hewlett and Duncan, *Atomic Shield*, p. 134. For the lack of guidance on how to build another Little Boy, see Abrahamson and Carew, *Vanguard of Atomic Deterrence*, pp. 41–42.
- 119 (97) *He’d wrapped the metal around a Coke bottle*: See Abrahamson and Carew, *Vanguard of Atomic Deference*, p. 42.
- 119 (97) *the final assembly of Mark 3 bombs*: *Ibid.*, pp. 60–61.
- 120 (97) “*a very serious potential hazard to a large area*”: Quoted in Hansen, *Swords of Armageddon*, vol. I, p. 137.
- 120 (97) *secretly constructed at two Royal Air Force bases*: During the summer of 1946, the head of the Royal Air Force and the head of the United States Army Air Forces had decided that British bases should have atomic bomb assembly equipment, “just in case.” See Abrahamson and Carew, *Vanguard of Atomic Deterrence*, pp. 115–17; Ken Young, “No Blank Cheque: Anglo-American (Mis)understandings and the Use of the English Airbases,” *Journal of Military History*, vol. 71, no. 4 (October 2007), 1136–40; and Ken Young, “US ‘Atomic Capability’ and the British Forward Bases in the Early Cold War,” *Journal of Contemporary History*, vol. 42, no. 1 (January 2007), pp. 119–22.
- 120 (98) “*if one blew, the others would survive*”: Quoted in Abrahamson and Carew, *Vanguard of Atomic Deterrence*, p. 119.
- 120 (98) *parts and cores to assemble fifty-six atomic bombs*: See Wainstein et al., “Evolution of U.S. Command and Control,” p. 34.
- 121 (98) *deploy only one bomb assembly team overseas*: The AFSWP had two fully trained teams by the end of 1948—but lacked the support personnel to send

- both into the field at the same time. See *ibid.*, p. 17: and Abrahamson and Carew, *Vanguard of Atomic Deterrence*, pp. 68–69, 150.
- 121 (98) *Robert Peurifoy was a senior at Texas A&M*: Peurifoy Interview.
- 121 (99) *killed more than two million civilians*: That is a conservative estimate; the Korean War was especially brutal for non combatants. According to Dong-Choon Kim, who served as Standing Commissioner of the Truth and Reconciliation Commission of South Korea, “the percentage of civilian deaths was higher than in any other war of the 20th century.” For the estimate and the quote, see Dong-Choon Kim, “The War Against the ‘Enemy Within’: The Hidden Massacres in the Early Stages of the Korean War,” in Gi-Wook Shin, Soon-Won Park, and Daqing Yang, eds., *Rethinking Historical Injustice and Reconciliation in Northeast Asia: The Korean Experience* (New York: Routledge, 2007), p. 75.
- 122 (99) *“prevent premature detonation”*: “Final Evaluation Report, MK IV MOD O FM Bonb”, “The Mk IV Evaluation Committee, Sandia Laboratory, Report No. SL-82, September 13, 1949 (secret/restricted data/declassified), p. 60.
- 123 (100) *“integrated contractor complex”*: See Furman, *Sandia National Laboratories*: pp. 310–12.

## UNTER VERLETZUNG

- 125 (101) *Jeff Kennedy had just gotten home*: Interview with Jeffrey Kennedy.
- 128 (103) *Kennedy thought, “Wow”*: *Ibid.*
- 129 (105) *“Commander, if you want to tell me how to do my job”*: Quoted in *ibid.*
- 131 (106) *Sandaker was a twenty-one-year-old PTS technician*: Interview with James Sandaker.
- 131 (106) *“Well, I got to go”*: *Ibid.*
- 131 (106) *“All right,” Sandaker said*: *Ibid.*
- 132 (107) *“baby oil trailer”*: See “Report, Major Missile Accident, Titan II Complex 374-7,” Statement of Archie G. James, Staff Sergeant, Tab U-42, p. 1.
- 133 (108) *“Tell it not to land”*: Holder interview.
- 134 (109) *“Jeff, I fucked up like you wouldn’t believe”*: Quoted in Kennedy interview.
- 135 (109) *“Oh, David,” Kennedy said*: *Ibid.*

- 135 (110) *Sam Hutto's family had farmed the same land*: Interview with Sam Hutto.
- 136 (110) *"We went into, through, and out of the Depression"*: Quoted in *ibid*.
- 138 (112) *he Air Force provided few additional details*: Interview with Robert Lyford, Governor Bill Clinton's liaison to various state agencies, including the Department of Emergency Services and the Department of Public Safety. See also "Missile Fuel Leaks; 100 Forced to Leave Area Near Arkansas," *Arkansas Gazette*, September 19, 1980; Tyler Tucker, "Officials Had No Early Knowledge of Missile Explosion, Tatom Says," *Arkansas Democrat*, September 25, 1980; and Carol Matlock, "Air Force Listens to Complaints, Says Notification Was Adequate," *Arkansas Gazette*, September 25, 1980.
- 138 (113) *about fifty thousand gallons of radioactive water leaked*: Cited in "Arkansas Office of Emergency Services, Major Accomplishments During 1979–1980," Attachment 1, Highlights of Response to Emergencies in 1980.
- 139 (113) *Bill Clinton was an unlikely person*: For a good sense of America's youngest governor in 1980, see David Maraniss, *First in His Class: A Biography of Bill Clinton* (New York: Simon & Schuster, 1996), pp. 352–86; Bill Clinton, *My Life* (New York: Alfred A. Knopf, 2004), pp. 254–89; and Phyllis Finton Johnston, *Bill Clinton's Public Policy for Arkansas: 1979–1980*, (Little Rock, AR: August House, 1982).
- 139 (113) *"tall, handsome, a populist-liberal"*: Quoted in Wayne King, "Rapidly Growing Arkansas Turns to Liberal Politicians," *New York Times*, May 14, 1978.
- 139 (113) *"He was a punk kid with long hair"*: Quoted in Roger Morris, *Partners in Power: The Clintons and Their America* (New York: Henry Holt, 1999), p. 218.
- 140 (114) *"the Three Beards"*: See Maraniss, *First in His Class*, pp. 364–65.
- 141 (115) *"Captain Mazzaro, we have to get that propane tank"*: Kennedy interview.
- 143 (116) *"Stay here"*: Quoted in Powell interview.
- 143 (116) *"Hell no"*: *Ibid*.
- 143 (116) *"I'll give you three minutes"*: *Ibid*.
- 143 (117) *"There's not enough room for two people"*: Quoted in *ibid*.
- 143 (117) *"Oh, God"*: Quoted in Kennedy interview.

- 143 (117) *“Sir, this is what the tank readings are”*: Kennedy interview and “Report, Major Missile Accident, Titan II Complex 374-7,” Kennedy statement, Tab U-46, p. 4.
- 143 (117) *“Where in hell did you get those?”*: “Report, Major Missile Accident, Titan II Complex 374-7,” Statement of James L. Morris, Colonel, Tab U-60, p. 1.

## MEGATOTE

- 146 (119) *Fred Charles Iklé began his research*: Interview with Fred Charles Iklé. For his early work on the subject, see Fred C. Iklé, “The Effect of War Destruction upon the Ecology of Cities,” *Social Forces*, vol. 29, no. 4 (May 1951), pp. 383–91; and Fred C. Iklé, “The Social Versus the Physical Effects from Nuclear Bombing,” *Scientific Monthly*, vol. 78, no. 3 (March 1954), pp. 182–87.
- 146 (119) *killed about 3.3 percent of Hamburg’s population*: Cited in Fred Charles Iklé, *The Social Impact of Bomb Destruction* (Norman: University of Oklahoma Press, 1958), p. 16.
- 146 (119) *destroyed about half of its homes*: Cited in *ibid.*
- 146 (119) *“A city re-adjusts to destruction”*: *Ibid.*, p. 8.
- 146 (119) *British planners had assumed that for every metric ton*: For the lethal efficiencies of Second World War bombing, see *ibid.*, pp. 17–18.
- 147 (120) *Iklé devised a simple formula*: For the calculations on the relationship between bomb destruction and population loss, see *ibid.*, pp. 53–56.
- 147 (120) *“the fully compensating increase in housing density”*: *Ibid.*, p. 55.
- 147 (120) *when about 70 percent of a city’s homes were destroyed*: *Ibid.*, p. 72.
- 147 (120) *Project RAND became one of America’s first think tanks*: For an unsurpassed account of RAND and its influence on postwar strategic policy, see Fred Kaplan, *The Wizards of Armageddon: The Untold Story of the Small Group of Men Who Have Devised the Plans and Shaped the Policies on How to Use the Bomb* (Stanford, CA: Stanford University Press, 1983). For a more recent look at the history, see Alex Abella, *Soldiers of Reason: The RAND Corporation and the Rise of the American Empire* (New York:

- Harcourt, 2008.) 148 (121)      “*It is not a pleasant task*”: Iklé, *Social Impact of Bomb Destruction*, p. viii.
- 148 (121)      *The casualties were disproportionately women*: Cited in *ibid.*, p. 205.
- 148 (121)      *Even in Hiroshima, the desire to fight back survived*: *Ibid.*, p. 180.
- 149 (122)      “*the sheer terror of the enormous destruction*”: *Ibid.*, p. 120.
- 150 (123)      “*It is my conviction that a peaceful settlement*”: Quoted in Hansen, *Swords of Armageddon*, vol. 2, pp. 85–86.
- 151 (123)      “*the policy of exterminating civilian populations*”: Quoted in May et al., “History of Strategic Arms Competition,” pt 1, p. 65.
- 151 (123)      “*a weapon of genocide*”: Quoted in Hewlett and Duncan, *Atomic Shield*, p. 384.
- 151 (123)      “*a danger to humanity ... an evil thing*”: For the full text of the statement by Fermi and Rabi, see “Minority Report on the H-Bomb,” *Bulletin of the Atomic Scientists*, December 1976, p. 58.
- 151 (123)      *a “quantum leap” past the Soviets*: Quoted in McGeorge Bundy, *Danger and Survival: Choices About the Bomb in the First Fifty Years* (New York: Random House, 1988), p. 204.
- 151 (124)      “*proceed with all possible expedition*”: Quoted in “View from Above,” p. 203.
- 151 (124)      “*total power in the hands of total evil*”: Quoted in Hewlett and Duncan, *Atomic Shield*, p. 402.
- 151 (124)      *most likely “psychological”*: Quoted in Herken, *Winning Weapon*, p. 316.
- 151 (124)      “*In that case, we have no choice*”: Quoted in Robert H. Ferrell, *Harry S. Truman: A Life* (Columbia: University of Missouri Press, 1994), p. 350.
- 152 (124)      *Albert Einstein read a prepared statement*: See “Einstein Fears Hydrogen Bomb Might Annihilate ‘Any Life,’” *Washington Post*, February 13, 1950.
- 165 (124)      *the “hysterical character” of the nuclear arms race*: For the full text of Einstein’s statement, see “Dr. Einstein’s Address on Peace in the Atomic Era,” *New York Times*, February 13, 1950.
- 152 (124)      *the “disastrous illusion”*: *Ibid.*
- 152 (124)      “*In the end, there beckons more and more clearly*”: *Ibid.*
- 152 (124)      “*psychological considerations*”: “Effect of Civilian Morale on Military Capabilities in a Nuclear War Environment: Enclosure ‘E,’ The Relationship to Public Morale of Information About the Effects of Nuclear

- Warfare,” WSEG Report No. 42, Weapons Systems Evaluation Group, Joint Chiefs of Staff, October 20, 1959 (CONFIDENTAL/declassified), p. 53.
- 152 (124) *“Weapons systems in themselves”*: Ibid.
- 152 (124) *“information program”*: Ibid., p. 54.
- 152 (125) *“What deters is not the capabilities”*: Ibid.
- 153 (125) *“Any U.S. move toward abandoning or suspending work”*: Quoted in Hans Bethe, “Sakharov’s H-Bomb,” *Bulletin of the Atomic Scientists*, October 1990, p. 9.
- 153 (125) *the transfer of eighty-nine atomic bombs*: See Wainstein et al., “Evolution of U.S. Command and Control,” p. 31: and Feaver, *Guarding the Guardians*, pp. 134–36.
- 152 (126) *the transfer of fifteen atomic bombs without cores*: Wainstein et al., “Evolution of U.S. Command and Control,” p. 31.
- 152 (126) *personal responsibility for the nine weapons*: Ibid., p. 32.
- 154 (126) *the United States had about three hundred atomic bombs*: Ibid., p. 34.
- 154 (126) *more than one third of them were stored*: Eighty-nine were in Great Britain, fifteen on the *Coral Sea*, and nine on the island of Guam.
- 154 (126) *the AEC had eleven employees*: See “History of the Custody and Deployment of Nuclear Weapons (U): July 1945 Through September 1977,” Office of the Assistant to the Secretary of Defense (Atomic Energy), February 1978 (top secret/restricted data/declassified), p. 13.
- 154 (126) *“Our troops guarded [the atomic bombs]”*: Quoted in Kohn and Harahan, *Strategic Air Warfare*, p. 92.
- 154 (127) *“If I were on my own and half the country”*: Quoted in *ibid.*, p. 93.
- 155 (127) *applied for a patent*: Innovations in nuclear weapon design had been secretly patented since the days of the Manhattan Project. For a fascinating account of how a legal procedure originally created to ensure public knowledge became one used to deny it, see Alex Wellerstein, “Patenting the Bomb: Nuclear Weapons, Intellectual Property, and Technological Control,” *Isis*, vol. 99, no. 1 (March 2008), pp. 57–87.
- 155 (127) *“a bomb in a box”*: Quoted in Hansen, *Swords of Armageddon*, vol. 1, p. 182.

- 155 (128) *“In addition to all the problems of fission”*: Quoted in Anne Fitzpatrick, “Igniting the Elements: The Los Alamos Thermonuclear Project, 1942–1952,” (thesis, Los Alamos National Laboratory, LA-13577-T, July 1999), p. 121.
- 156 (129) *The machine was called MANIAC*: The effort to create a hydrogen bomb not only depended on the use of electronic computers for high-speed calculations, it also helped to bring those machines into existence. For the inextricable link between thermonuclear weapon design and postwar computer science in the United States, see “Nuclear Weapons Laboratories and the Development of Supercomputing,” in Donald MacKenzie, *Knowing Machines: Essays on Technical Change* (Cambridge, MA: MIT Press, 1998), pp. 99–129; “Why Build Computers?: The Military Role in Computer Research,” in Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA: MIT Press, 1996), pp. 43–73; Francis H. Harlow and N. Metropolis, “Computing and Computers: Weapons Simulation Leads to the Computer Era,” *Los Alamos Science*, Winter/Spring 1983, pp. 132-144; Herbert L. Anderson, “Metropolis, Monte Carlo, and the MANIAC,” *Los Alamos Science*, Fall 1986, pp. 96–107; N. Metropolis, “The Age of Computing: A Personal Memoir,” *Daedalus*, A New Era in Computation, vol. 121, no. 1, (1992), pp. 119–30; and Fitzpatrick, “Igniting the Elements,” pp. 99–173.
- 157 (129) *a mushroom cloud that rose about twenty-seven miles*: See “Progress Report to the Joint Committee on Atomic Energy, Part III: Weapons,” United States Atomic Energy Commission, June Through November, 1952 (top secret/restricted data/declassified), p. 5.
- 158 (129) *The fireball ... was roughly three and a half miles wide*: Cited in Hansen, *Swords of Armageddon*, vol. 3, p. 67.
- 158 (129) *more than a mile in diameter and fifteen stories deep*: See Appendix A, Summary of Available Crater Data, in “Operation Castle, Project 3.2: Crater Survey, Headquarters Field Command, Armed Forces Special Weapons Project, June 1955 (secret/formerly restricted data/ declassified), p. 60.
- 158 (129) *yield of the device was 10.4 megatons*: Cited in “Operation Ivy 1952,” United States Atmospheric Nuclear Weapons Tests, Nuclear Test Personnel Review, Defense Nuclear Agency, DNA 6036F, December 1, 1982, p. 17.

- 158 (129) *"The war of the future would be one"*: For Truman's remarks, see "Text of President's Last State of the Union Message to Congress, Citing New Bomb Tests," *New York Times*, January 8, 1953.
- 158 (130) *Project Vista, a top secret study*: For a good account of the study, see David C. Elliott, "Project Vista and Nuclear Weapons in Europe," *International Security*, vol. 11, no. 1, (Summer 1986), pp. 163–83.
- 158 (130) *an allied army with 54 divisions*: Cited in May et al., "History of Strategic Arms Competition," *pt 1*, p. 140.
- 158 (130) *thought to have 175 divisions*: Cited in *ibid.*, p. 139.
- 158 (130) *a "trip wire," a "plate glass wall"*: *Ibid.*, p. 172.
- 158 (130) *bring the "battle back to the battlefield"*: Quoted in Kai Bird and Martin J. Sherwin, *American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer* (New York: Vintage 2006), p. 445.
- 159 (130) "preventing attacks on friendly cities": Quoted in Elliott, "Project Vista," p. 172.
- 159 (131) *"Successful offense brings victory"*: "Remarks: General Curtis E. LeMay at Commander's Conference," Wright-Patterson Air Force Base, January 1956 (top secret/Declassified), NSA, p. 17.
- 159 (131) *the "counterforce" strategy*: For the thinking behind counterforce, see T. F. Walkowicz, "Strategic Concepts for the Nuclear Age," *Annals of the American Academy of Political and Social Science*, vol. 299, Air Power and National Security, May 1955, pp. 118–27, and Alfred Goldberg, "A Brief Survey of the Evolution of Ideas About Counterforce," prepared for U.S. Air Force Project RAND, Memorandum RM-5431-PR, October 1967 (revised March 1981), NSA.
- 159 (131) *"Offensive air power must now be aimed"*: Quoted in Futrell, *Ideas*, vol. 1, p. 441.
- 160 (131) *"for us to build enough destructive power"*: Quoted in Richard G. Hewlett and Jack M. Holl, *Atoms for Peace and War, 1953–1961: Eisenhower and the Atomic Energy Commission* (Berkeley: University of California Press, 1989), p. 3.
- 161 (132) *"In the event of hostilities"*: "A Report to the National Security Council by the Executive Secretary on Basic National Security Policy," NSC 162/2, October 30, 1953 (top secret/declassified), p. 22.



- 161 (132) *“maintain a massive capability to strike back”*: “Text of President Eisenhower’s State of the Union,” *Washington Post*, January 8, 1954.
- 161 (132) *“a great capacity to retaliate, instantly”*: “Text of Dulles’ Statement on Foreign Policy of Eisenhower Administration,” *New York Times*, January 13, 1954.
- 161 (132) *“massive retaliation”*: The name of the new strategy obscured the fact that General LeMay and the Strategic Air Command had no intention of allowing the United States to be hit first. For Eisenhower’s views about nuclear weapons and the threat that the Soviet Union seemed to pose, see Samuel F. Wells, Jr., “The Origins of Massive Retaliation,” *Political Science Quarterly*, vol. 96, no. 1 (Spring 1981), pp. 31–52; and Richard K. Betts, “A Nuclear Golden Age? The Balance Before Parity,” *International Security*, vol. 11, no. 3 (Winter 1986), pp. 3–32.
- 162 (132) *the number of personnel at SAC increased by almost one third, and the number of aircraft nearly doubled*: In 1952 the Strategic Air Command had 1,638 aircraft and employed 166,021 people; by 1956 it had 3,188 and employed 217,279. Cited in Norman Polmar, ed., *Strategic Air Command: People, Aircraft and Missiles* (Annapolis, MD: Nautical and Aviation Publishing Company of America, 1979), pp. 28, 44.
- 162 (133) *more than one fifth of its funding and about one quarter of its troops*: According to the historian A. J. Bacevich, in 1953 Eisenhower cut the Army’s fiscal year 1955 budget from \$13 billion to \$10.2 billion and lowered the number of troops from 1,540,000 to 1,164,000. See Bacevich, “The Paradox of Professionalism: Eisenhower, Ridgway, and the Challenge to Civilian Control, 1953–1955,” *Journal of Military History*, vol. 61, no. 2, (April 1997), p. 314.
- 162 (133) *“national fiscal bankruptcy would be far preferable”*: Quoted in *ibid.*, p. 321.
- 162 (133) *151,000 nuclear weapons*: For the number of weapons that the Army sought and how it hoped to use them, see “History of the Custody and Deployment,” p. 50.
- 163 (134) *“emergency capability” weapons*: For the definition of the phrase, see “History of the Early Thermonuclear Weapons: Mks 14, 15, 16, 17, 24, and

- 29,” Information Research Division, Sandia National Laboratories, RS 3434/10, June 1967 (SECRET/RESTRICTED DATA/declassified), p. 17.
- 163 (134) *Code-named Project Brass Ring*: See *ibid.*, p. 15; and Hansen, *Swords of Armageddon*, vol. 2, pp. 119–20, 262.
- 163 (134) *Agnew remembered seeing footage of Nazi tasks*: Agnew interview.
- 164 (134) “*We’ve got to find out*”: *Ibid.*
- 164 (135) *The program, known as Project Paperclip*: For details of the program, see John Gimbel, “U.S. Policy and German Scientists: The Early Cold War,” *Political Science Quarterly*, vol. 101, no. 3 (1986), pp. 433–451; Linda Hunt, *Secret Agenda: The United States Government, Nazi Scientists, and Project Paperclip, 1945 to 1990* (New York: St. Martin’s 1991); and Tom Bower, *The Paperclip Conspiracy: The Hunt for the Nazi Scientists* (Boston: Little, Brown, 1987).
- 164 (135) “*rescue those able and intelligent Jerries*”: LeMay, *Mission with LeMay*, p. 398.
- 164 (135) “*Oh yes,*” *Knacke replied*: Agnew interview.
- 165 (135) *Bob Peurifoy led the team at Sandia*: Peurifoy interview.
- 166 (137) *a temperature of about -423 degrees Fahrenheit*: Cited in Hansen, *Swords of Armageddon* vol. 3, p. 56.
- 167 (137) *he’d climbed two hundred feet to the top*: Bernard O’Keefe and a friend flipped a coin to see who’d have to disarm the nuclear device. O’Keefe lost, got into a Jeep, and headed to the tower. See O’Keefe, *Nuclear Hostages*, pp. 154–6.
- 167 (137) “*Is this building moving or am I getting dizzy?*”: Quoted in *ibid.*, p. 178.
- 167 (137) “*My God, it is*”: *Ibid.*
- 167 (137) “*like it was resting on a bowl of jelly*”: *Ibid.*, p. 179.
- 167 (137) *Shrimp’s yield was 15 megatons*: Cited in Hewlett and Holl, *Atoms for Peace* p. 174.
- 167 (137) *almost three times larger than ... predicted*: Cited in *ibid.*
- 167 (137) *about two hundred billion pounds of coral reef and the seafloor*: The crater dug by the blast was roughly two thousand yards wide, with a maximum depth of eighty yards. As Bob Peurifoy and his son, Steve, a fellow engineer, explained to me, the crater was “an inverted, very-high-aspect ratio, right circular cone.” The volume of such a cone is one-third of the

base area multiplied by the height. According to their calculations, the volume of the Bravo crater was about eighty million cubic yards—and a cubic yard of sandy topsoil weighs about twenty-five hundred pounds. That means the amount of material displaced by the explosion weighed about two hundred billion pounds. To get a visual sense of that amount, imagine a pile of sand and coral the size of a football field that extends about seven miles into the sky. I am grateful to the Peurifoys for these figures. For the dimensions of the crater formed by the Bravo test, see “Operation Castle, Crater Survey,” p. 24.

- 167 (137) *cloud that soon stretched for more than sixty miles*: The mushroom cloud reached a maximum height of about 310,000 feet and a width of about 350,000 feet. See Vincent J. Jodoin, “Nuclear Cloud Rise and Growth” (dissertation, Graduate School of Engineering, Air Force Institute of Technology, Air University, June 1994), p. 89.
- 168 (138) *The dangers of radioactive fallout*: For a good explanation of how residual radiation is created, how long it can last, and what it can do to human beings, see Glasstone, *Effects of Nuclear Weapons*, pp. 414–501, 577–663.
- 168 (138) *The “early fallout” of a nuclear blast*: See *ibid.*, pp. 416–42.
- 169 (139) *A dose of about 700 roentgens is almost always fatal*: See *ibid.*, p. 461.
- 169 (139) *“Delayed fallout” poses a different kind of risk*: See *ibid.*, pp. 473–88.
- 170 (139) *an amount of fallout that surprised everyone*: See *ibid.*, pp. 460–61; and Hewlett and Holl, *Atoms for Peace*, pp. 171–82, 271–79.
- 170 (140) *The villagers had seen the brilliant explosion*: See Hewlett and Holl, *Atoms for Peace*, p. 174.
- 170 (140) *a Japanese fishing boat, the Lucky Dragon*: The story of the unfortunate crew can be found in *ibid.*, pp. 175–77; and Ralph E. Lapp, *The Voyage of the Lucky Dragon* (New York: Harper & Brothers, 1958).
- 170 (140) *the fallout pattern from the Bravo test was superimposed*: The map can be found in Hewlett and Holl, *Atoms for Peace*, p. 181.
- 171 (140) *if a similar 15-megaton groundburst hit*: *Ibid.*, p. 182. Within an area of roughly 6,000 square miles—about 135 miles long and 35 miles wide—the fatality rate among people who did not evacuate or find shelter would be close to 100 percent. See Glasstone, *Effects of Nuclear Weapons*, p. 461.

- 171 (141) *its first atomic bomb, the “Blue Danube”*: Instead of numerical signifiers, the British came up with all sorts of evocative names for their nuclear weapons, including: “Blue Peacock,” an atomic land mine; “Blue Steel,” an air-launched missile with a thermonuclear warhead; “Green Cheese,” a proposed antiship missile with an atomic warhead; “Indigo Hammer,” a small atomic warhead for use with anti-aircraft missiles; “Red Beard,” a tactical bomb; “Tony,” an atomic warhead used in anti-aircraft missiles; and “Winkle,” an atomic warhead developed for the Royal Navy. A thorough list of them can be found in Richard Moore, “The Real Meaning of the Words: A Pedantic Glossary of British Nuclear Weapons,” UK Nuclear History Working Paper, no. 1, Mountbatten Centre for International Studies (March 2004).
- 171 (141) *a yield of about 16 kilotons*: Cited in *ibid*, p. 3.
- 171 (141) *“With all its horrors, the atomic bomb”*: Quoted in “Debate in House of Commons, April 5, 1954” *Hansard*, vol. 526, p. 48.
- 171 (141) *Strath submitted his report in the spring of 1955*: For details of the report, see Jeff Hughes, “The Strath Report: Britain Confronts the H-Bomb, 1954–1955,” *History and Technology*, vol. 19, no. 3 (2003), pp. 257–75; Robin Woolven, “UK Civil Defence and Nuclear Weapons, 1953–1959,” UK Nuclear History Working Paper, no. 2, Mountbatten Centre for International Studies, (n.d.); and Peter Hennessy, *The Secret State: Whitehall and the Cold War* (New York: Penguin, 2003), pp. 132–46.
- 172 (141) *“render the UK useless”*: The quote is from an intelligence report submitted to Strath. See Hennessy, *Secret State*, p. 133.
- 172 (141) *“The heat flash from one hydrogen bomb”*: Quoted in Hughes, “The Strath Report,” p. 268.
- 172 (141) *If the Soviets detonated ten hydrogen bombs*: See Hennessy, *Secret State*, p. 121.
- 172 (141) *Almost one third of the British population would be killed*: See Hughes, “The Strath Report,” p. 270.
- 172 (141) *the most productive land might “be lost for a long time”*: Quoted in *ibid.*, p. 269.
- 172 (141) *“Machinery of Control”*: For the workings of the proposed martial law, see Hennessy, *Secret State*, p. 139; and Hughes, “The Strath Report,” p. 270.

- 172 (142) *“drastic emergency powers,” and ... “rough and ready methods”*: Quoted in Hughes, “The Strath Report,” p. 270.
- 172 (142) *Churchill ordered the BBC not to broadcast news*: Ibid., pp. 272–73.
- 172 (142) *“Influence depended on possession of force”*: Quoted in Hennessy, *Secret State*, p. 54.
- 172 (142) *“We must do it”*: Quoted in *ibid.*, p. 44.
- 173 (142) *build an underground shelter “right now”*: Quoted in Allen Drury, “U.S. Stress on Speed,” *New York Times*, March 12, 1955.
- 173 (142) *“we had all better dig and pray”*: Quoted in *ibid.*
- 173 (142) *“YOUR CHANCES OF SURVIVING AN ATOMIC ATTACK”*: “Survival Under Atomic Attack,” The Official U.S. Government Booklet, Distributed by Office of Civil Defense, State of California, Reprint by California State Printing Division, October 1950, p. 4.
- 173 (142) *“EVEN A LITTLE MATERIAL GIVES PROTECTION”*: Ibid., p. 8.
- 173 (143) *“WE KNOW MORE ABOUT RADIOACTIVITY”*: Ibid., p. 8.
- 173 (143) *“KEEP A FLASHLIGHT HANDY”*: Ibid., p. 19.
- 173 (143) *“AVOID GETTING WET AFTER UNDERWATER BURSTS”*: Ibid., p. 23.
- 173 (143) *“BE CAREFUL NOT TO TRACK RADIOACTIVE MATERIALS”*: Ibid., p. 27.
- 174 (143) *Val Peterson called for concrete pipelines to be laid*: See Anthony Levieros, “Big Bomb Blast Jolted Civil Defense Leaders; But Program Still Lags,” *New York Times*, June 10, 1955.
- 174 (143) *“Duck and cover,” one journalist noted*: See Bernard Stengren, “Major Cities Lag in Planning Defense Against Bomb Attack,” *New York Times*, June 12, 1955.
- 174 (143) *Hoping to boost morale*: The historians Guy Oakes and Andrew Grossman have argued that the underlying goal of Operation Alert and other civil defense exercises was “emotion management”—reassuring the public in order to maintain support for nuclear deterrence. The propaganda value of such drills was considered far more important than their potential usefulness during a Soviet attack. See Guy Oakes and Andrew Grossman, “Managing Nuclear Terror: The Genesis of American Civil Defense Strategy,” *International Journal of Politics, Culture, and Society*, vol. 5, no. 3 (1992), pp. 361–403; and Guy Oakes, “The Cold War Conception of Nuclear

- Reality: Mobilizing the American Imagination for Nuclear War in the 1950's," *International Journal of Politics, Culture, and Society*, vol. 6, no. 3 (1993), pp. 339–63. For an overview of official efforts to protect the nation's capital, literally and symbolically, see David F. Krugler, *This Is Only a Test: How Washington D.C. Prepared for Nuclear War* (New York: Palgrave Macmillan, 2006).
- 174 (143) *sixty-one cities were struck by nuclear weapons*: For the imaginary attack and the estimated carnage, see Anthony Leviero, "H-Bombs Test U.S. Civil Defense," *New York Times*, June 16, 1955; and Edward T. Folliard, "Tests Over U.S. Indicate Centers Might Suffer Heavily in Raid," *Washington Post*, June 16, 1955.
- 174 (143) *the corner of North 7th Street and Kent Avenue*: See Anthony Leviero, "U.S. H-Bomb Alert Today; Eisenhower, Top Officials Among 15,000 Slated to Leave Capital," *New York Times*, June 15, 1955.
- 174 (143) *the United States would "be able to take it"*: Quoted in Anthony Leviero, "Mock Martial Law Invoked in Bombing Test Aftermath," *New York Times*, June 17, 1955.
- 174 (143) *only 8.2 million people would be killed and 6.6 million wounded*: Cited in *ibid.*
- 174 (144) *more than half of those casualties would be in New York City*: The casualty estimates for the city were quite specific—2,991,285 deaths and 1,776,889 wounded. And yet those numbers did not dim the upbeat reporting of the drill. Cited in Peter Kihss, "City Raid Alert Termed a Success," *New York Times*, June 16, 1955.
- 174 (144) *"we might—ideally—escape"*: Quoted in "Anthony Leviero, "Eisenhower Hails Operation Alert as Encouraging," *New York Times*, June 18, 1955.
- 174 (144) *"great encouragement"*: Quoted in *ibid.*
- 175 (144) *"staggering"*: Quoted in Betts, "A Nuclear Golden Age?," pp. 3–32.
- 175 (144) *A new word had entered the lexicon ... megadead*: According to the *Oxford English Dictionary*, the word appeared in print for the first time on June 21, 1953, in an Alabama newspaper, the *Birmingham News*.
- 175 (144) *"The United States experienced ... total economic collapse"*: I read an edited version of this quote in Betts, "Nuclear Golden Age?," p. 14, and

then sought out the original in Robert H. Ferrell, ed., *The Eisenhower Diaries* (New York: W. W. Norton, 1981), p. 311.

- 175 (144) *“It would be perfect rot to talk about shipping troops”*: At a White House meeting, Eisenhower lost his cool, pounded the table repeatedly, and said, “You see, actually, the only thing we fear is an atomic attack delivered by air on our cities. God damn it? It would be perfect rot to talk about shipping troops abroad when fifteen of our cities were in ruins. You would have disorder and almost complete chaos in the cities and in the roads around them. You would have to restore order and who is going to restore it? Do you think the police and fire departments of those cities could restore order? Nuts! That order is going to have to be restored by disciplined armed forces.” According to Eisenhower’s press secretary, the room fell silent, and you could hear a pin drop. Quoted in “Diary Entry by the President’s Press Secretary (Hagerty),” Washington, D.C., February 1, 1955, United States State Department, *Foreign Relations of the United States, 1955–1957, vol. 19, National Security Policy* (Washington, D.C.: U.S. Government Printing Office, 1990), pp. 39–40.
- 175 (144) *“You can’t have this kind of war”*: Quoted in Gregg Herken, *Counsels of War* (New York: Oxford University Press, 1987), p. 116.

## DRITTER TEIL: ES WIRD UNFÄLLE GEBEN

### HINNEHMBARE RISIKEN

- 178 (147) *Jimmy Stewart enlisted in the Army*: For a fine account of Stewart’s military service, see Starr Smith, *Jimmy Stewart: Bomber Pilot* (Minneapolis: Zenith Press, 2005).
- 178 (147) *He flew dozens of those missions*: Cited in *ibid.*, p. 263.
- 178 (147) *“He always maintained a calm demeanor”*: The officer was Colonel Ramsay Potts, commander of the 453rd Bomb Group. Quoted in *ibid.*, p. 125.

- 178 (147) *Stewart visited SAC headquarters*: For the origins of the film, see Hedda Hopper, “General LeMay Briefs Stewart for Film,” *Los Angeles Times*, December 27, 1952. The film is also mentioned at some length in the chapter “The Heyday of SAC: The High Point of the Popular Culture Crusade,” in Steve Call, *Selling Air Power: Military Aviation and Popular Culture After World War II* (College Station, TX: Texas A&M University Press, 2009), pp. 100–131.
- 178 (148) *“Toughest Cop of the Western World”*: See Ernest Havemann, “Toughest Cop of the Western World,” *Life*, June 14, 1954.
- 179 (148) *“It wouldn’t dare”*: Quoted in *ibid.*
- 180 (149) *a study by the RAND analyst Albert Wohlstetter*: See A. J. Wohlstetter, F. S. Hoffman, R. J. Lutz, and H. S. Rowen, “Selection and Use of Strategic Bases,” a report prepared for United States Air Force Project Rand, R-266, April 1954 (secret/declassified).
- 180 (149) *“Training in SAC was harder than war”*: The officer was General Jack J. Catton, who served with LeMay for sixteen years. Quoted in Kahn and Harahan, *Strategic Air Warfare*, p. 97.
- 180 (149) *Rhineland, Wisconsin, became one of SAC’s favorite targets*: See Thomas M. Coffey, *Iron Eagle: The Turbulent Life of General Curtis LeMay* (New York: Crown Publishers, 1986), p. 342.
- 180 (149) *the SAC battle plan called for 180 bombers*: Cited in Wainstein et al. “*Evolution of U.S. Command and Control*,” p. 257.
- 180 (149) *the bombardier had aimed at the wrong island*: See Hansen, *Swords of Armageddon, Volume IV*, pp. 160–2.
- 181 (150) *94 SAC bombers tested the air defense system*: For the results of Operation Tailwind, see Wainstein et al. “*Evolution of U.S. Command and Control*,” pp. 103–4.
- 181 (150) *Ten Bisons flew past the reviewing stand*: The CIA later admitted its error; the ten that flew past were the only ten in existence. See Donald P. Steury, ed., *Intentions and Capabilities: Estimates on Soviet Strategic Forces, 1953–1983*, (Washington, D.C.: History Staff, Center for the Study of Intelligence, Central Intelligence Agency, 1996), p. 5.
- 181 (150) *more than 100 of the planes*: General LeMay publicly testified that the Soviets already had that many—and he may even have believed it. During a



top secret speech to his own officers, LeMay said the Soviet Union would soon be building 300 new bombers a year. For the 100 estimate, see “Bison vs. B-52: LeMay Testifies,” *New York Times*, May 6, 1956. For his prediction about Soviet bomber production, see “Remarks: LeMay at Commander’s Conference,” p. 13.

- 181 (150) *the Soviets would be able to attack the United States with 700 bombers:* Cited in “Soviet Gross Capabilities for Attack on the US and Key Overseas Installations and Forces Through Mid-1959,” National Intelligence Estimate Number 11-56, Submitted by the Director of Central Intelligence, 6 March 1956 (top secret/declassified), p. 3, in *Intentions and Capabilities*, p. 16.
- 181 (150) *“It is clear that the United States and its allies”:* Quoted in “The Nation: Wilson Stands Ground,” *New York Times*, July 8, 1956.
- 182 (150) *an extra \$900 million for new B-52s:* In this case a Democratic Congress approved a major increase in defense spending that a Republican president didn’t want. See “Wilson Raps Any Air Fund Boost,” *Los Angeles Times*, June 22, 1956, and “House-Senate Group Agrees to Hike Air Force Budget by \$900 Million,” *Wall Street Journal*, June 29, 1956.
- 182 (151) *By the end of the decade, the Soviet Union had about 150 long-range bombers:* In 1958, the Soviet Union had about 50 Bison bombers and 105 Bears. Cited in May et al, “History of Strategic Arms Competition,” p. 186.
- 182 (151) *the Strategic Air Command had almost 2,000:* In 1959, SAC had 488 B-52 bombers and 1,366 B-47s. See Polmar, *Strategic Air Command: People*, p.61.
- 182 (151) *such a system would “provide a reasonable degree”:* Quoted in Wainstein et al. “Evolution of U.S. Command and Control,” p. 201.
- 182 (151) *at least two hours’ warning of an attack:* Cited in *ibid.*, p. 203.
- 182 (151) *a distance of about twelve thousand miles:* Cited in *ibid.*, p. 207.
- 182 (151) *almost half a million tons of building material:* Roughly 459,900 tons were transported into the Arctic by barges, planes, and tractor-pulled sleds. Cited in James Louis Isemann, “To Detect, to Deter, to Defend: The Distant Early Warning (DEW) Line and Early Cold War Defense Policy, 1953–1957,” dissertation, Department of History, Kansas State University, 2009, p. 299.
- 182 (151) *temperatures as low as -70 degrees Fahrenheit:* Cited in *ibid.*, p. 304.

- 183 (152) *“The computerization of society”*: I first encountered the quote in Edwards, *The Closed World*, on page 65. The original source is a fascinating book: Frank Rose, *Into the Heart of the Mind: An American Quest for Artificial Intelligence* (New York: Harper & Row, 1984).
- 183 (152) *America’s first large-scale electronic digital computer, ENIAC*: The acronym stood for Electronic Numerical Integrator and Computer.
- 184 (152) *researchers concluded that the Whirlwind computer*: It is hard to overstate the importance of the Whirlwind computer and the SAGE air defense system that evolved from it. The historian Thomas P. Hughes described the creation of SAGE as “one of the major learning experiences in technological history”—as important as the construction of the Erie Canal. The historians Kent C. Redmond and Thomas M. Smith have called SAGE “a technical innovation of such consequence as to make it one of the major human accomplishments of the twentieth century.” And yet one of the great ironies of SAGE, according to the historian Paul N. Edwards, is that it probably wouldn’t have worked. “It was easily jammed,” Edwards noted, “and tests of the system under actual combat conditions were fudged to avoid revealing its many flaws.” It created the modern computer industry and transformed society—but probably wouldn’t have detected a Soviet bomber attack. For these quotes, as well as descriptions of how SAGE influenced the future, see Thomas P. Hughes, *Rescuing Prometheus: Four Monumental Projects That Changed the Modern World* (New York: Vintage, 1998), p. 15; Kent C. Redmond and Thomas M. Smith, *From Whirlwind to Mitre: The R&D Story of the SAGE Air Defense Computer* (Cambridge, MA: MIT Press, 2000), p. 429; and Edwards, *Closed World*, p. 110.
- 184 (153) *the first computer network*: See Edward, *Closed World*, p. 101.
- 184 (153) *contained about 25,000 vacuum tubes and covered about half an acre*: Cited in Hughes, *Rescuing Prometheus*, p. 51.
- 185 (153) *SAGE created the template for the modern computer industry*: See Redmond and Smith, *From Whirlwind to Mitre*, pp. 436–43; and Edwards, *The Closed World*, pp. 99–104.
- 185 (154) *almost five hours after being sent*: During a SAC command exercise in September 1950 the average transmission time for teletype messages was

- four hours and forty-five minutes. See Wainstein et al., “Evolution of U.S. Command and Control,” p. 78.
- 185 (154) *a special red telephone at SAC headquarters*: See *ibid.*, p. 162.
- 185 (154) *an automated command-and-control system*: It was called the SAC 456L System, or SACCS—the Strategic Automated Command and Control System. It was commissioned in 1958 but did not become fully operational until 1963. See *ibid.*, pp. 169–70; and “The Air Force and the Worldwide Military Command and Control System, 1961–1965,” Thomas A. Sturm, USAF Historical Division Liaison Office, DASMC-66 013484, SHO-S-66/279, August 1966 (secret/declassified), NSA, p. 12.
- 185 (154) *from an hour and a half to six hours behind the planes*: See Wainstein, et al. “Evolution of U.S. Command and Control,” p. 170.
- 186 (154) *“I don’t think I would put that much money”*: Quoted in “Supersonic Air Transports,” Report of the Special Investigating Subcommittee of the Committee on Science and Astronautics, U.S. House of Representatives, Eighty-Sixth Congress, Second Session, 1960, p. 47.
- 186 (154) *It extended three levels underground and could house about eight hundred people*: See “Welcome to Strategic Air Command Headquarters,” Directorate of Information, Headquarters Strategic Air Command, Offutt Air Force Base (n.d.).
- 186 (155) *Below the East Wing at the White House*: For Roosevelt’s bunker and the construction of a new bunker for Truman, see Krugler, *This Is Only a Test*, pp. 68–75.
- 186 (155) *an underground complex with twenty rooms*: Cited in *ibid.*, p. 73.
- 186 (155) *the airburst of a 20-kiloton atomic bomb*: Cited in *ibid.*, p. 70.
- 186 (155) *Known as Site R*: For details about Site R, see *ibid.*, p. 63–6.
- 186 (155) *enough beds to accommodate two thousand high-ranking officials*: The actual number was 2,200. Cited in Wainstein et al. “Evolution of U.S. Command and Control,” p. 232.
- 186 (155) *the Air Force and the other armed services disagreed*: The Air Force viewed Site R as a military command post that should be manned by those who would need to give orders during wartime, not as a refuge for Pentagon officials or unnecessary personnel. See *ibid.*, pp. 226–32.

- 186 (155) *at Mount Weather, a similar facility*: For the details of this bunker and its operations, see Krugler *This Is Only a Test*, pp. 106–7, 165–6; Ted Gup, “Doomsday Hideaway,” *Time*, December 9, 1991; and Ted Gup, “The Doomsday Blueprints,” *Time*, August 10, 1992.
- 187 (155) *Eisenhower had secretly given nine prominent citizens*: CONELRAD, a Web site devoted to Cold War history and culture, obtained Eisenhower’s letters appointing the men to serve in these posts during a national emergency. Ten men were eventually asked to serve, after one resigned from his position. See “The Eisenhower Ten” at [www.conelrad.com](http://www.conelrad.com).
- 187 (156) *Patriotic messages from Arthur Godfrey*: Bill Geerhart, a founder of the CONELRAD Web site, has been determined for more than twenty years to obtain a copy of Arthur Godfrey’s public address announcement about nuclear war. See “Arthur Godfrey, the Ultimate PSA” and “The Arthur Godfrey PSA Search: Updated” at [www.conelrad.com](http://www.conelrad.com). The existence of these messages by Godfrey and Edward R. Murrow was mentioned in *Time* magazine. See “Recognition Value,” *Time*, March 2, 1953.
- 187 (156) *Beneath the Greenbrier Hotel*: See Ted Gup, “Last Resort: The Ultimate Congressional Getaway,” *Washington Post*, May 31, 1992; Thomas Mallon, “Mr. Smith Goes Underground,” *American Heritage*, September 2000; and John Strausbaugh, “A West Virginia Bunker Now a Tourist Spot,” *New York Times*, November 12, 2006.
- 187 (156) *A bunker was later constructed for the Federal Reserve*: Once known as “Mount Pony,” the site is now used by the Library of Congress to store old sound recordings and films. See “A Cold War Bunker Now Shelters Archive,” *Los Angeles Times*, August 31, 2007.
- 188 (156) *inside the Kindsbach Cave*: See A. L. Shaff, “World War II History Buried in Kindsbach,” *Kaiserslautern American*, July 1, 2011.
- 188 (156) *the code names SUBTERFUGE, BURLINGTON, and TURNSTYLE*: For the story of the Central Government Emergency War Headquarters, see Nick McCamley, *Cold War Secret Nuclear Bunkers: The Passive Defense of the Western World During the Cold War* (Barnsley, South Yorkshire: Pen & Sword Military Classics, 2007), pp. 248–77, and Hennessy, *Secret State*, pp. 186–205.

- 188 (156) *a pub called the Rose & Crown*: That detail can be found in Maurice Chittenden, “For Sale: Britain’s Underground City,” *Sunday Times* (London), October 30, 2005.
- 188 (157) *half a dozen large storage sites*: The AEC had added three more national stockpile sites—Site Dog in Bossier, Louisiana; Site King in Medina, Texas; and Site Love in Lake Mead, Nevada.
- 189 (157) *the president ... would have to sign a directive*: For the transfer procedure, see Wainstein, et al., “Evolution of U.S. Command and Control,” pp. 34–5.
- 189 (157) *SAC would get the cores in about twelve minutes*: Ibid., p. 35.
- 189 (157) *Eisenhower approved the shipment of nuclear cores*: Before leaving office, Truman had formally granted the Department of Defense the authority to have custody of nuclear weapons outside the continental United States—and within the United States “to assure operational flexibility and military readiness.” But Truman did not release any additional weapons to the military. At the end of his administration, the AEC had custody of 823 nuclear weapons—and the military controlled just the 9 weapons sent to Guam during the Korean War. Eisenhower’s decision in June 1953 put the new policy into effect, and within a few years the military had sole custody of 1,358 nuclear weapons, about one third of the American stockpile. For the text of Eisenhower’s order, see “History of Custody and Deployment,” p. 29. For the number of weapons in military and civilian custody during those years, see Wainstein, et al., “Evolution of U.S. Command and Control,” p. 34; and for a thorough account of the power shift from the Atomic Energy Commission to the Department of Defense, see Feaver *Guarding the Guardians*, pp. 128–63.
- 190 (158) *make the stockpile much less vulnerable to attack*: Secretary of Defense Charles E. Wilson and the Joint Chiefs of Staff both used this argument. See Feaver, *Guarding the Guardians*, p. 162, and “History of Custody and Deployment,” p. 37.
- 190 (158) *he’d pushed hard for dropping them on Chinese troops*: In a 1952 memo to the secretary of the Army, Nichols argued that the United States should “utilize atomic weapons in the present war in Korea the first time a reasonable opportunity to do so permits.” The use of nuclear weapons against military targets in North Korea and air bases in northeast China,

- Nichols thought, might “precipitate a major war at a time when we have the greatest potential for winning it with minimum damage to the U.S.A.” See Kenneth D. Nichols, *The Road to Trinity: A Personal Account of How America’s Nuclear Policies Were Made* (New York: William Morrow, 1987), pp. 291–92.
- 190 (158) “*No active capsule will be inserted*”: Quoted in “History of Custody and Deployment,” p. 39.
- 190 (158) “*Designated Atomic Energy Commission Military Representatives*”: The acronym for these new keepers of the nuclear cores was DAECMRs. See Feaver, *Guarding the Guardians*, p. 167, and “History of Custody and Deployment,” p. 111.
- 190 (158) *The Strategic Air Command stored them at air bases*: For the list of the bases and the types of nuclear weapons they stored, see “History of the Strategic Air Command, 1 January 1958—30 June 1958, Historical Study No. 73, Volume I 1958 (top secret/restricted data/declassified), pp. 88–90.
- 191 (159) “*to provide rapid availability for use*”: Quoted in “History of Custody and Deployment,” p. 37.
- 192 (160) *On at least three different occasions*: In one incident, a technician slipped during the test of a Mark 6 bomb and accidentally pulled out its arming wires, triggering the detonators. See “Accidents and Incidents Involving Nuclear Weapons: Accidents and Incidents During the Period 1 July 1957 Through 31 March 1967,” Technical Letter 20-3, Defense Atomic Support Agency, October 15 1967, (secret/restricted data/declassified), p. 1, Accident #1 and #3; p. 2, Accident #5.
- 192 (160) *a “wooden bomb*”: For the effort to develop nuclear weapons with a long shelf life, see Furman, *Sandia: Postwar Decade*, pp. 660–66, and Leland Johnson, *Sandia National Laboratories: A History of Exceptional Service in the National Interest* (Albuquerque, NM: Sandia National Laboratories, 1997), pp. 57–8.
- 192 (160) “*Thermal batteries*” *had been invented*: For the history, uses, and basic science of thermal batteries, see: Ronald A. Guidotti, “Thermal Batteries: A Technology Review and Future Directions,” Sandia National Laboratory, presented at the 27th International SAMPE Technical Conference, October 9–12, 1995; and Ronald A. Guidotti, P. Masset, “Thermally Activated

- (‘Thermal’) Battery Technology, Part I: An Overview,” *Journal of Power Sources*, vol. 161 (2006), pp. 1443–49.
- 192 (160) *a shelf life of at least twenty-five years*: Cited in Guidotti, “Thermal Batteries: A Technological Review,” p. 3.
- 192 (161) *the Genie, a rocket designed for air defense*: For details about the first air-to-air nuclear rocket, see Hansen, *Swords of Armageddon*, vol. VI, pp. 2–50, and Christopher J. Bright, *Continental Defense in the Eisenhower Era: Nuclear Antiaircraft Arms and the Cold War* (New York: Palgrave Macmillan, 2010), pp. 65–94.
- 193 (162) *a top secret panel on the threat of surprise attack*: Killian’s group was called the Technological Capabilities Panel of the Science Advisory Committee, and “Meeting the Threat of Surprise Attack” was the title of its report.
- 194 (162) *a “lethal envelope” with a radius of about a mile*: See Hansen, *Swords of Armageddon*, vol. VI, pp. 45–6.
- 194 (162) *“probability of kill” ... was likely to be 92 percent*: Cited in *ibid.*, p. 46.
- 195 (163) *“The Department of Defense has a most urgent need”*: Quoted in *ibid.*, p. 21.
- 195 (163) *Project 56 was the code name*: In an oral history interview, Harry Jordan, a Los Alamos scientist, later described one of the rationales for the tests: “People worried that in shipping these weapons that they could go off accidentally ... one accidental detonator could go, and would go nuclear in Chicago railroad yards or something.” See “Harry Jordan, Los Alamos National Laboratory,” National Radiobiology Archives Project, September 22, 1981, p. 1.
- 196 (163) *“one-point safe”*: I am grateful to Bob Peurifoy and Harold Agnew for explaining the determinants of one-point safety to me.
- 197 (164) *The fourth design failed the test*: Harry Jordan called it “a small nuclear incident.” Although the yield was less than one kiloton, it revealed that the weapon design wasn’t one-point safe. See “Harry Jordan,” p. 2.
- 197 (164) *“The problem of decontaminating the site”*: “Plutonium Hazards Created by Accidental or Experimental Low-Order Detonation of Nuclear Weapons,” W. H. Langham, P. S. Harris, and T. L. Shipman, Los Alamos Scientific

- Laboratory, LA-1981, December 1955 (secret/restricted data/declassified), p. 34.
- 197 (164) *“probably not safe against one-point detonation”*: Quoted in Hansen, *Swords of Armageddon*, vol. VI, p. 32.
- 197 (165) *They argued that if such authority was “predelegated”*: “The effective use of atomic warheads in air defense,” the Killian report had argued, “requires a doctrine of instant use as soon as a hostile attack has been confirmed.” This quote and a thorough examination of the new policy can be found in Peter J. Roman, “Ike’s Hair-Trigger: U.S. Nuclear Predelegation, 1953–60,” *Security Studies*, vol. 7, no. 4, pp. 121–64.
- 197 (165) *it was “critical” for the Air Force*: Quoted in *ibid.*, p. 133.
- 197 (165) *any Soviet aircraft that appeared “hostile”*: Quoted in *ibid.*, p. 138.
- 197 (165) *“strict command control [sic] of forces”*: Quoted in *ibid.*
- 198 (165) *the French government wasn’t told about the weapons*: In January 1952, President Truman authorized the deployment of atomic bombs to Morocco, without their nuclear cores—and without French authorization. See Wainstein, et al, “Evolution of U.S. Command and Control,” p. 32.
- 198 (165) *“a positive effect on national morale”*: Letter, Herbert B. Loper, assistant to the secretary of defense (Atomic Energy), to Lewis L. Strauss, chairman, Atomic Energy Commission,” December 18, 1956 (secret/declassified), NSA, p. 1.
- 198 (165) *“The possibility of any nuclear explosion”*: The full text of Wilson’s press release, issued on February 20, 1957, can be found in Hansen, *Swords of Armageddon*, Volume VI, pp. 37–38. This quote appears on page 37.
- 198 (166) *“a hundredth of a dose received”*: *Ibid.*, p. 38.
- 198 (166) *“It glowed for an instant”*: “National Affairs: The A-Rocket,” *Time*, July 29, 1957.
- 199 (166) *Quarles left the meetings worried*: See “The Origins and Evolution of S2C at Sandia National Laboratories 1949 – 1996,” William L. Stevens, consultant to Surety Assessment Center, Sandia National Laboratories, SAND99-1308, September 2001 (official use only).
- 199 (166) *He rarely took vacations*: These details come from “Quarles Held a Unique Niche,” *Washington Post and Times Herald*, May 9, 1959; “Donald A. Quarles, Secretary of the Air Force,” Department of the Air Force, Office of



- Information Services, May 1956, NSA; and George M. Watson, *The Office of the Secretary of the Air Force, 1947–1965* (Washington, D.C.: Center for Air Force History, 1993), pp. 149–63.
- 199 (166) *Within weeks of the briefings for Quarles:* See Stevens, “Origins and Evolutions of S2C at Sandia,” p. 30.
- 199 (166) *Quarles asked the Atomic Energy Commission to conduct:* See “A Survey of Nuclear Weapon Safety Problems and the Possibilities for Increasing Safety in Bomb and Warhead Design,” prepared by Sandia Corporation with the advice and assistance of the Los Alamos Scientific Laboratory and the University of California Ernest O. Lawrence Radiation Laboratory, RS 3466/26889, February 1959, (secret/restricted data/declassified), p. 10.
- 199 (167) *a list of eighty-seven accidents:* Cited in *ibid.*, p. 15.
- 200 (167) *Sandia found an additional seven:* Cited in *ibid.*
- 200 (167) *More than one third ... “war reserve” atomic or hydrogen bombs:* See *ibid.*, p. 16.
- 200 (167) *The rest involved training weapons:* See *ibid.*
- 200 (167) *a B-36 bomber took off from Eielson Air Force Base:* For a description of the accident see Michael H. Maggelet and James C. Oskins, *Broken Arrow: The Declassified History of U.S. Nuclear Weapons Accidents* (Raleigh, NC: Lulu, 2007), pp. 33–44, and Norman S. Leach, *Broken Arrow: America’s First Lost Nuclear Weapon* (Calgary, Ontario, Canada: Red Deer Press, 2008), pp. 75–111.
- 201 (168) *On at least four different occasions, the bridgewire detonators:* See “Accidents and Incidents Involving Nuclear Weapons,” p. 1, Accident #1.
- 201 (168) *At least half a dozen times, the carts used to carry Mark 6 bombs:* See *ibid.*, p. 8, Incident #1.
- 201 (168) *Dropping a nuclear weapon was never a good idea:* According to a study released by the Armed Forces Special Weapons Project in 1958, “Extreme shocks can cause failure of one or more of the presently used safety devices and warhead components, which could contribute to a full-scale nuclear detonation, particularly if the X-unit is already charged.” See “A Study on Evaluation of Warhead Safing Devices,” Headquarters Field Command, Armed Forces Special Weapons Project, FC/03580460, March 31, 1958, (secret/restricted data/declassified), p. 18.

- 201 (168) *when the Genie was armed, it didn't need a firing signal*: See "Vulnerability Program Summary: Joint DOD-AEC Weapon Vulnerability Program," Armed Forces Special Weapons Project, FC/010 May 1958 (secret/restricted data/declassified), p. 44.
- 201 (168) *a B-29 bomber prepared to take off from Fairfield-Suisun*: For the story of the plane crash and its aftermath, see Jim Houk, "The Travis Crash Exhibit," *Travis Air Museum News*, vol. XVII, no. 3 (1999), pp. 1, 5–11; John L. Frisbee, "The Greater Mark of Valor," *Air Force Magazine*, February 1986; and the accident report reproduced in Maggelet and Oskins, *Broken Arrow*, pp. 65–77.
- 203 (170) *"a long training mission"*: Quoted in "Bomb-Laden B-29 Hits Trailer Camp; 17 Killed, 60 Hurt," *New York Times*, August 7, 1950.
- 203 (170) *an American B-47 bomber took off from Lakenheath*: I first learned about this accident from a document obtained by the National Security Archive: "B-47 Wreckage at Lakenheath Air Base," Cable, T-5262, July 22, 1956 (secret/declassified). The accident report is reproduced in Maggelet and Oskins, *Broken Arrow*, pp. 85–87.
- 203 (170) *"The B-47 tore apart the igloo"*: "B-47 Wreckage at Lakenheath Air Base."
- 204 (171) *"Some day there will be an accidental explosion"*: Morgenstern made the assertion in 1959. Quoted in Joel Larus, *Nuclear Weapons Safety and the Common Defense* (Columbus, OH: Ohio State University, 1967), p. 17–18.
- 204 (171) *"Maintaining a nuclear capability"*: "A Survey of Nuclear Weapon Safety Problems" p. 14.
- 204 (171) *"Acceptable Military Risks from Accidental Detonation"*: Although I did not obtain the Army study, its conclusions are explored in "Acceptable Premature Probabilities for Nuclear Weapons," Headquarters Field Command, Armed Forces Special Weapons Project, FC/10570136, October 1, 1957 (secret/restricted data/declassified).
- 204 (171) *the acceptable probability of a hydrogen bomb ... should be 1 in 100,000*: See *ibid.*, p. 4.
- 204 (171) *The acceptable risk of an atomic bomb ... set at 1 in 125*: See *ibid.* p. 4.
- 204 (171) *the "psychological impact of a nuclear detonation"*: *Ibid.*
- 204 (171) *"there will likely be a tendency to blame"*: *Ibid.*

- 204 (171) *Human error had been excluded as a possible cause:* Ibid., p. 6.
- 205 (171–72) *“The unpredictable behavior of human beings”:* Ibid.
- 205 (172) *the odds of a hydrogen bomb exploding ... should be one in ten million:* Ibid. p. 13.
- 205 (172) *odds of a hydrogen bomb detonating by accident, every decade, would be one in five:* For a nuclear weapon with a yield greater than 10 kilotons, removed from stockpile storage, the study proposed an accidental detonation rate of 1 in 50,000 over the course of ten years. Putting 10,000 of those weapons into “handling, maintenance, assembly and test operations,” therefore, lowered the odds of an accidental detonation to 1 in 5 every decade. See Ibid., p. 14.
- 206 (172) *the odds of an atomic bomb detonating by accident ... would be about 100 percent:* For a nuclear weapon with a yield lower than 10 kilotons, removed from stockpile storage, the study proposed an accidental detonation rate of 1 in 10,000 per weapon over the course of ten years. If the United States possessed 10,000 of such weapons, at least one of them would most likely detonate by accident within that period. See *ibid.*, p. 14.
- 206 (172) *During a fire, the high explosives of a weapon might burn:* See “Factors Affecting the Vulnerability of Atomic Weapons to Fire, Full Scale Test Report No. 2,” Armour Research Foundation of Illinois Institute of Technology, for Air Force Special Weapons Center, February 1958 (secret/restricted data/declassified); and “Vulnerability Program Summary,” pp. 10–20, 58–60. 206 (172) *“the real key”:* “A Survey of Nuclear Weapon Safety Problems,” p. 28.
- 207 (173) *The time factor for the Genie was three minutes:* Cited in “Vulnerability Program Summary,” p. 59.
- 207 (173) *Carl Carlson, a young physicist at Sandia, came to believe:* A short biographical sketch of Carlson—who advocated passionately on behalf of nuclear weapon safety, resigned from Sandia in frustration at one point, and later took his own life—can be found in Stevens, “Origins and Evolution of S2C at Sandia,” p. 236.
- 207 (173) *the T-249 control box made it easy to arm a weapon:* See *ibid.*, pp. 21–27.
- 207 (173) *“a weapon which requires only the receipt of intelligence:* Ibid., p. 51.

- 207 (173) *“always/never”*: Peter Douglas Feaver succinctly explains and defines the “always/never problem” of controlling nuclear weapons in his book, *Guarding the Guardians*, pp. 12–20, 28–32.
- 208 (174) *“a higher degree of nuclear safing”*: Quoted in “A Survey of Nuclear Weapon Safety Problems,” p. 13.
- 208 (174) *“Such safing,” Quarles instructed*: Quoted in *ibid.*

## DIE OPTIMALE MISCHUNG

- 209 (175) *“A super long-distance intercontinental”*: “Text of Soviet Statement,” *New York Times*, August 27, 1957.
- 209 (175) *a radio signal of “beep-beep”*: Some experts speculated, erroneously, that the beeping was part of a Soviet secret code. See Marvin Miles, “Russ Moon’s Code Sending Analyzed,” *Los Angeles Times*, October 9, 1957.
- 209 (175) *boasted that Laika lived for a week*: See Max Frankel, “Satellite Return Seen as Soviet Goal,” *New York Times*, November 16, 1957.
- 209 (175) *she actually died within a few hours of liftoff*: Like the Soviet Union’s other space dogs, Laika was a stray picked up on the streets of Moscow. She died from excess heat in the capsule. See Carol Kino, “Art: Boldly, Where No Dog Had Gone Before,” *New York Times*, November 4, 2007.
- 209 (176) *“weakened the free world” and “starved the national defense”*: Quoted in “Rocket Race: How to Catch Up,” *New York Times*, October 20, 1957.
- 209 (176) *“a devastating blow to U.S. prestige”*: Quoted in “Why Did U.S. Lose the Race? Critics Speak Up,” *Life*, October 21, 1957.
- 210 (176) *“plunge heavily” into the missile controversy*: For a fine account of how *Sputnik* affected political and bureaucratic rivalries not only in the United States but also in the Soviet Union, see Matthew Brzezinski, *Red Moon Rising: Sputnik and the Hidden Rivalries That Ignited the Space Age* (New York: Henry Holt 2007). The quote by George Reedy can be found on page 213.
- 210 (176) *“blast the Republicans out of the water”*: Quoted in *ibid.*, p. 182.
- 210 (176) *putting “fiscal security ahead of national security”*: Quoted in Christopher A. Preble, “Who Ever Believed in the “ ‘Missile Gap’ ”?: John F. Kennedy

- and the Politics of National Security,” *Presidential Studies Quarterly*, vol. 33, no. 4 (December 2003), p. 806.
- 210 (176) *“The United States does not have an intercontinental missile”*: These quotes can be found in a report prepared by the CIA for the newly elected president, John F. Kennedy: “Compendium of Soviet Remarks on Missiles,” February 28, 1961 (secret/declassified), NSA.
- 210 (176) *More than twenty thousand Hungarian citizens were killed*: Cited in Mark Kramer, “The Soviet Union and the 1956 Crises in Hungary and Poland: Reassessments and New Findings,” *Journal of Contemporary History*, vol. 33, no. 2 (April 1998), p. 210.
- 210 (176) *hundreds more were later executed*: Cited in *ibid.*, p. 211.
- 211 (177) *He was particularly irritated by a secret report*: The report was “Deterrence & Survival in the Nuclear Age,” Security Resources Panel of the Science Advisory Committee, November 7, 1957, (TOP SECRET/declassified).
- 211 (177) *“It misses the whole point to say”*: Quoted in Robert J. Donovan, “Killian Missile Czar: Ike Picks M.I.T. Head to Rush Research, Development,” *Daily Boston Globe*, November 8, 1957.
- 211 (177) *“we have slipped dangerously behind the Soviet Union”*: Quoted in “Excerpts from the Comments of Senator Johnson, Dr. Teller, and Dr. Bush,” *New York Times*, November 26, 1957.
- 211 (177) *“just about the grimmest warning”*: Stewart Alsop, “We Have Been Warned,” *Washington Post and Times Herald*, November 25, 1957.
- 212 (178) *“locate precise blast locations”*: Wainstein, et al., “Evolution of U.S. Command and Control,” p. 218. For the science behind the Bomb Alarm System, see “Operation Dominic II, Shot Small Boy, Project Officers Report—Project 7.14: Bomb Alarm Detector Test,” Cecil C. Harvell, Defense Atomic Support Agency, April 19, 1963, (confidential/formerly restricted data/declassified).
- 212 (179) *The logistics of such a “ground alert”*: For the origins and workings of SAC’s ground alert, see “The SAC Alert Program, 1956–1959,” Headquarters, Strategic Air Command, January 1960 (secret/ declassified), NSA, pp. 1–79, and “History of the Strategic Air Command, 1 January 1958—30 June 1958,” pp. 25–57.

- 213 (179) *a mean son of a bitch*: In his memoir, Power belittled the military's role in peacekeeping, defending national security, and maintaining deterrence. "Putting aside all the fancy words and academic doubletalk," he wrote, "the basic reason for having a military is to do two jobs—to kill people and to destroy the works of man." See Thomas S. Power, with Albert A. Arnhyrn, *Design for Survival* (New York: Coward-McCann, 1964), p. 229.
- 213 (179) *"sort of an autocratic bastard"*: Quoted in Coffey, *Iron Eagle*, p. 276.
- 214 (179) *The basic premise of SAC's airborne alert*: For the origins of this bold strategy, see "The SAC Alert Program, 1956–1959," pp. 80–140, and "History of Strategic Air Command, June 1958—July 1959," Historical Study No. 76, Volume I, Headquarters, Strategic Air Command (secret/restricted data/declassified), pp. 107–36.
- 214 (180) *The mission would "fail safe"*: The idea of relying on fail-safe procedures to send bombers toward the Soviet Union was first proposed by RAND in a 1956 report. See "Protecting U.S. Power to Strike Back in the 1950's and 1960's," A. J. Wohlstetter, F. S. Hoffman, H. S. Rowen, U.S. Air Force Project RAND, R-290, September 1, 1956, (for official use only), pp. 59–62. For SAC's adoption of fail safe, see "History of the Strategic Air Command, 1 January 1958—30 June 1958," pp. 66–74.
- 215 (180) *"Day and night, I have a certain percentage of my command"*: Quoted in "Alert Operations and Strategic Air Command, 1957–1991," Office of the Historian, Headquarters Strategic Air Command, December 7, 1991, p. 7. Power made the remark at a press conference in Paris, and the boast unnerved some of America's NATO allies. See "Lloyd Defends H-Bomb Patrols by U.S.," *Washington Post and Times Herald*, November 28, 1957.
- 215 (180) *Designers at the weapons labs had been surprised*: Peurifoy Interview. See also "A Review of the US Nuclear Weapon Safety Program—1945 to 1986," R. N. Brodie, Sandia National Laboratories, SAND86-2955, February 1987 (secret/restricted data/declassified), p. 11.
- 215 (181) *"nuclear safety is not 'absolute,' it is nonexistent"*: "A Survey of Nuclear Weapon Safety Problems," p. 53.
- 215 (181) *The odds of a nuclear detonation during a crash or a fire*: According to the Air Force, "There was a 15 percent probability of up to 40,000 pounds of nuclear yield in the event of one point detonation of a weapon requiring the

- insertion of an in-flight capsule.” The Air Force also claimed that “with the sealed pit weapon the plutonium hazard was not significant.” See “History of the Strategic Air Command, 1 January 1958—30 June 1958,” pp. 78–79.
- 215 (181) *“operationally unsuitable”*: Those are the words of the official SAC history. See *ibid.*, p. 82.
- 215 (181) *“degrade the reaction time to an unacceptable degree”*: Quoted in *ibid.*, p. 83.
- 216 (181) *“crew morale and motivation”*: Quoted in *ibid.*
- 216 (181) *The typical air base had only seven dummy weapons*: Cited in *ibid.*
- 216 (181) *The AEC refused to allow any fully assembled bombs*: At a briefing on the proposed airborne alert in July 1958, Eisenhower was told that during SAC exercises, “Completely assembled or war-ready weapons have never been flown before.” See “Briefing for the President on SAC [Strategic Air Command] Operations with Sealed-Pit Weapons,” Briefing Paper, July 9, 1958 (top secret/ declassified), NSA, p. 2.
- 217 (182) *likely to miss its target by about one hundred miles*: On average, the V-2 went about four miles off-course during a two-hundred-mile flight. An American missile with the same “average error,” launched from Colorado and aimed at Moscow, would fly about five thousand miles—and miss the Soviet capital by roughly one hundred miles. For the V-2’s accuracy and relevance to the Air Force’s missile aspirations, see Donald MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: MIT Press, 1993), p. 99.
- 217 (182) *He wanted SAC to develop nuclear-powered bombers*: Not only did General LeMay believe that such aircraft were essential, his successor, General Power, thought that SAC also needed a Deep Space Force—a fleet of twenty spaceships that could carry nuclear weapons and remain in orbit near the moon for years. The spaceships would be propelled by the detonation of small atomic bombs. The secret effort to build them, “Project Orion,” was funded by the Pentagon from 1958 until 1965. The program to develop nuclear-powered bombers lasted from 1946 until 1961. Having a nuclear reactor on an airplane posed a number of design problems: the shielding necessary to protect the crew would be extremely heavy; without the shielding the crew might be exposed to hazardous levels of radiation; and if

- the plane crashed, the area surrounding the crash site could be badly contaminated. Nevertheless, LeMay thought these challenges could be overcome. For the story of the Aircraft Nuclear Propulsion (ANP), see Herbert F. York, *Race to Oblivion: A Participant's View of the Arms Race*, (New York: Simon & Schuster, 1970), pp. 60–74. For the attempt to harness “Nuclear Pulse Propulsion” for a Deep Space Force, see George Dyson, *Project Orion: The True Story of the Atomic Spaceship* (New York: Henry Holt, 2002), pp. 193–207.
- 217 (182) *“the ultimate weapon”*: See “SAC [Strategic Air Command] Position on Missiles,” letter from General Curtis E. LeMay, commander in chief of Strategic Air Command, to General Nathan F. Twining, chief of staff, U.S. Air Force, November 26, 1955 (secret/declassified), NSA.
- 218 (182) *The interservice rivalry over missiles*: For the fierce bureaucratic warfare over these new weapons, see Michael H. Armacost’s *Politics of Weapon Innovation* and Samuel P. Huntington, “Interservice Competition and the Political Roles of the Armed Services,” *American Political Science Review*, vol. 55, no. 1 (March 1961), pp. 40–52.
- 218 (183) *a Soviet “peace campaign”*: Through organizations such as the World Peace Council and the World Federation of Scientific Workers, the Soviet Union tried to turn public opinion in Europe against the nuclear policies of the United States. See Laurence S. Wittner, *Resisting the Bomb, 1954–1970: A History of the World Nuclear Disarmament Movement* (Stanford: Stanford University Press, 1997), pp. 86–92.
- 219 (183) *The Eisenhower administration tried to strike a balance*: For a fine account of the conflicting demands that the president faced, see “Eisenhower and Nuclear Sharing,” a chapter in Marc Trachtenberg, *A Constructed Peace: The Making of the European Settlement, 1945–1963* (Princeton: Princeton University Press, 1999), pp. 146–200.
- 219 (184) *The Mark 36 was a second-generation hydrogen bomb*: See Hansen, *Swords of Armageddon, Volume V*, pp. 395-7.
- 219 (184) *at a SAC base in Sidi Slimane, Morocco*: My account of the accident is based primarily on “Accidents and Incidents Involving Nuclear Weapons,” pp. 4-5, Accident #24; “Summary of Nuclear Weapons Incidents (AF Form 1058) and Related Problems, Calendar Year 1958,” *Airmunitions Letter*,



- Headquarters, Ogden Air Material Area, June 23, 1960 (secret/restricted data/declassified), p. 13; and interviews with weapon designers familiar with the event.
- 219 (184) *long past the time factor of the Mark 36*: The weapon's time factor was only three minutes. See "Vulnerability Program Summary," p. 58.
- 219 (184) *fearing a nuclear disaster*: An accident report said the evacuation was motivated by "the possibility of a nuclear yield." See "Summary of Nuclear Weapons Incidents, 1958," p. 13.
- 219 (185) *"a slab of slag material"*: Ibid.
- 219 (185) *The "particularly 'hot' pieces"*: Ibid.
- 220 (185) *plutonium dust on their shoes*: An accident report mentioned "alpha particles" and "dust" without noting their source: plutonium. See "Accidents and Incidents Involving Nuclear Weapons," p. 5.
- 220 (185) *"explosion of the weapon, radiation"*: The quote is a State Department paraphrase of what the Air Force wanted to say. See "Sidi Slimane Air Incident Involving Plane Loaded with Nuclear Weapon," January 31, 1958 (secret/declassified), NSA, p. 1.
- 220 (185) *The State Department thought that was a bad idea*: See *ibid.*
- 220 (185) *"The less said about the Moroccan incident"*: The quote is a summary of a State Department official's views, as presented in "Sidi Slimane Air Incident," p. 2.
- 220 (185) *a "practice evacuation"*: "Letter, from B.E.L. Timmons, director, Office of European Regional Affairs, U.S. State Department, to George L. West, political adviser, USEUCOM, February 28, 1958 (secret/declassified), NSA.
- 220 (185) *"In reply to inquiries about hazards"*: "Joint Statement by Department of Defense and Atomic Energy Commission," Department of Defense Office of Public Information, February 14, 1958, NSA, p. 1.
- 221 (185) *Less than a month later, Walter Gregg and his son*: My account of the accident in Mars Bluff is based on "Summary of Nuclear Weapons Incidents, 1958," pp. 8–12; "Mars Bluff," *Time*, March 24, 1958; "Unarmed Atom Bomb Hits Carolina Home, Hurting 6," *New York Times*, March 12, 1958; and Clark Ruinrill, "Aircraft 53-1876A Has Lost a Device: How the U.S. Air Force came to Drop an A-Bomb on South Carolina," *American*

- Heritage*, September 2000. Rumrill’s account is by far the best and most detailed.
- 221 (186) *about fifty feet wide and thirty-five feet deep*: The size of the crater varies in different sources, and I’ve chosen to use the dimensions cited in a contemporary accident report. See “Summary of Nuclear Weapons Incidents, 1958,” p. 8.
- 221 (187) *the plane had just lost a “device”*: Quoted in Runrill “Aircraft 53-1876A Has Lost a Device.” 222 (187) *“Are We Safe from Our Own Atomic Bombs?”*: Hanson W. Baldwin, “Are We Safe from Our Own Atomic Bombs?,” *New York Times*, March 16, 1958.
- 222 (187) *“Is Carolina on Your Mind?”*: Quoted in “The Big Binge,” *Time*, March 24, 1958.
- 222 (187) *a nuclear detonation had been prevented by “sheer luck”*: Quoted in “On the Risk of an Accidental or Unauthorized Nuclear Detonation,” Fred Charles Iklé, with Gerald J. Aronson and Albert Madansky, (confidential/restricted data/declassified), p. 65.
- 222 (187) *“the first accident of its kind in history”*: “‘Dead’ A-Bomb Hits U.S. Town,” Universal Newsreel, Universal-International News, March 13, 1958.
- 222 (187) *a hydrogen bomb had been ... mistakenly released over Albuquerque*: I learned the details of this accident from weapon designers. General Christopher S. Adams—former chief of staff at the Strategic Air Command and associate director of the Los Alamos National Laboratory—tells the story in his memoir, *Inside the Cold War: A Cold Warrior’s Reflections* (Maxwell Air Force Base, AL: Air University Press, September 1999), pp. 112–13.
- 223 (188) *“Well, we did not build these bombers”*: Power, *Design for Survival*, p. 132.
- 223 (188) *Macmillan was in a difficult position*: The United States informed the British when nuclear weapons were being flown into the United Kingdom—but did not reveal when “any particular plane is equipped with special weapons.” See “U.S. Bombers in Britain,” cable, from Walworth Barbour, U.S. State Department Deputy Chief of Mission, London, to Secretary of State John Foster Dulles, January 7, 1958 (top secret/declassified), NSA.
- 223 (188) *argued that nuclear weapons were “morally wrong”*: Some members of the C.N.D. wanted Great Britain to disarm unilaterally; others sought an end to

- hydrogen bomb tests and the use of British bases by American planes. The quote comes from a letter that the organization sent to Queen Elizabeth. See “Marchers’ Letter to the Queen,” *The Times* (London), June 23, 1958.
- 224 (188) “*I drew myself,*” Holtom recalled: Quoted in Clare Coulson, “50 Years of the Peace Symbol,” *Guardian* (U.K.), August 21, 2008. Holtom also described the symbol as the combination of two letters from the semaphore alphabet: “N” for nuclear and “D” for disarmament.
- 224 (188) “*Imagine that one of the airmen may*”: Quoted in IKIé, “On the Risk of an Accidental Detonation,” p. 61.
- 224 (188) *the “world has yet to see a foolproof system”*: See “Excerpts from Statements in Security Council on Soviet Complaint Against Flights,” *New York Times*, April 22, 1958.
- 22 (189) *67.3 percent of the flight personnel*: The report was circulated in May 1958. See IKIé, “On the Risk of an Accidental Detonation,” pp. 65–66; “CIA Says Forged Soviet Papers Attribute Many Plots to the U.S.,” *New York Times*, June 18, 1961; and Larus, *Nuclear Weapon Safety and the Common Defense*, pp. 60–61.
- 225 (189) *an American mechanic stole a B-45 bomber*: The mechanic had just consumed half a dozen pints of beer after being dumped by his sixteen-year-old British girlfriend. See “Eight Killed in Plane Crashes,” *The Times* (London), June 14, 1958; “AF Mechanic Killed in Stolen Plane,” *Washington Post*, June 15, 1948; IKIé “On the Risk of an Accidental Detonation,” p. 66; and Larus, *Nuclear Weapon Safety and the Common Defense*, p. 61.
- 225 (189) *more than 250,000 copies of George’s novel*: Cited in David E. Scherman, “Everybody Blows Up!,” *Life*, March 8, 1963.
- 225 (189) *Writing under the pseudonym “Peter Bryant”*: George had written thrillers for years under a number of other names. After the success of *Red Alert*, he wrote another, even darker, novel about the threat of nuclear war and—before completing a third book on the subject—took his own life at the age of forty-one. For George’s work and its influence upon the director Stanley Kubrick, see P. D. Smith, *Doomsday Men: The Real Dr. Strangelove and the Dream of the Superweapon* (New York: St. Martin’s, 2007), pp. 402–30.

- See also “Peter George, 41, British Novelist: Co-Author of ‘Strangelove’ Screenplay Is Dead,” *New York Times*, June 3, 1966.
- 225 (189) “*A few will suffer*”: Peter Bryant, *Red Alert* (New York: Ace Books, 1958), p. 97.
- 225 (189) “*the ultimate deterrent*”: Ibid., p. 80.
- 225 (190) *doubts about the idea expressed by LeMay*: President Eisenhower thought that an airborne alert might be useful during an emergency but saw no need for the Strategic Air Command to keep bombers in the air at all times. LeMay agreed with the president, concerned that an airborne alert would be too expensive and shorten the lifespan of its B-52 bombers. Secretary of Defense Neil H. McElroy and General Nathan F. Twining, head of the Joint Chiefs of Staff, also thought that a full-time airborne alert was unnecessary. But General Powell had made it politically important and a symbol of American power. For LeMay’s doubts, see “The SAC Alert Program, 1956–1959,” pp. 94–99, 118–29, and “History of Strategic Air Command, June 1958—July 1959,” pp. 114–15. For Eisenhower’s opposition to making the alert permanent, see “Editorial Note,” Document 53, in United States State Department, *Foreign Relations of the United States: 1958–1960, National Security Policy, Arms Control and Disarmament, Volume III* (Washington, D.C.: U.S. Government Printing Office, 1967), p. 201. For Twining’s opposition and the congressional pressure, see “Memorandum of Conference with President Eisenhower, February 9, 1959,” Document 49, in *ibid.*, pp. 49–50.
- 226 (190) “*positive control*”: SAC thought the term was more “absolute in intonation than ‘Fail Safe’” and would thwart Soviet attempts to turn world opinion against the plan. See “History of the Strategic Air Command, 1 January 1958—30 June 1958,” p. 66.
- 226 (190) “*the probability of any nuclear detonation*”: “Briefing for the President on SAC Operations with Sealed-Pit Weapons,” p. 8.
- 226 (190) *McCone thought that the bombers should only be permitted*: See “Memorandum of Conference with the President, August 27, 1958” (top secret/declassified), NSA, p. 1.
- 226 (190) *Iklé’s top secret clearance had gained him access*: Iklé spoke to me at length about how his research was conducted.

- 226 (191) *"We cannot derive much confidence"*: IKIÉ, "On the Risk of an Accidental Detonation," p. iv.
- 227 (191) *"eliminated readily once they are discovered"*: Ibid., p. 12.
- 226 (191) *inadvertently jettisoned once every 320 flights*: Cited in *ibid.*, p. 48.
- 227 (191) *crash at a rate of about once every twenty thousand flying hours*: The rate of major accidents among B-52s was five per one hundred thousand flying hours. Cited in *ibid.*, p. 75.
- 227 (191) *twelve crashes with nuclear weapons and seven bomb jettisons*: Cited in *ibid.*, p. 76.
- 227 (191) *"The paramount task"*: Ibid., p. 10.
- 227 (191) *"makes it necessary to entrust unspecialized personnel"*: Ibid., p. 16.
- 227 (191) *"someone who knew the workings"*: Ibid., p. 34 227 (192) *"It can hardly be denied that there is a risk"*: Ibid., p. 102.
- 227 (192) *"one of the most baffling problems"*: Ibid., p. 21.
- 228 (192) *About twenty thousand Air Force personnel*: Six thousand flight officers were assigned to nuclear missions at the time, and an additional sixteen thousand people tested, handled, or maintained the weapons. Cited in *ibid.*, p. 32.
- 228 (192) *"a history of transient psychotic disorders"*: Ibid., p. 27.
- 228 (192) *A few hundred Air Force officers and enlisted men were annually removed from duty*: Eighty-eight officers and about twice as many enlisted men were "separated or retired from service" in 1956 due to psychotic disorders. See *ibid.*, p. 29.
- 228 (192) *perhaps ten or twenty who worked with nuclear weapons*: In 1956, the proportion of Air Force officers forced to leave the service because of psychotic disorders was 0.61 per 1,000; the rate among enlisted men was twice as high. Those rates, applied to the roughly twenty thousand Air Force personnel who worked with nuclear weapons at the time, suggest that about ten to twenty of that group would suffer a psychotic breakdown every year. See *ibid.*, p. 29.
- 228 (192) *"a catalogue of derangement"*: Ibid., pp. 120–49.
- 228 (192) *"A 23-year-old pilot, a Lieutenant"*: Ibid., pp. 124–25.
- 228 (193) *"grandiose, inappropriate, and demanding" ... "eight hours on the B-25"*: Ibid., p. 125.

- 229 (193) “*invested with a special mission*”: Ibid., pp. 130–31.
- 229 (193) “*the authorities ... covertly wish destruction*”: Ibid., p. 131.
- 229 (193) “*the desire to see the tangible result of their own power*”: Ibid., p. 141.
- 229 (193) “[An] assistant cook improperly obtained a charge”: Ibid., p. 134.
- 229 (193) “*Private B and I each found a rifle grenade*”: Ibid., p. 135.
- 229 (193) “*A Marine found a 37-millimeter dud*”: Ibid., p. 136.
- 229 (194) “*the kind of curiosity which does not quite believe*”: Ibid., p. 137.
- 230 (194) “*an accidental atomic bomb explosion may well trigger*”: Quoted in *ibid.*, p. 90.
- 230 (194) “*unfortunate political consequences*”: Ibid., p. 83.
- 230 (194) “*a peaceful expansion of the Soviet sphere*”: Ibid., p. 84.
- 230 (194) “*The U.S. defense posture*”: Ibid., p. 95.
- 230 (194) *put combination locks on nuclear weapons*: Ibid., pp. 99–102.
- 231 (195) “*If such an accident occurred in a remote area*”: “The Aftermath of a Single Nuclear Detonation by Accident or Sabotage: Some Problems Affecting U.S. Policy, Military Reactions, and Public Information,” Fred Charles Iklé, with J. E. Hill, U.S. Air Force Project RAND, Research Memorandum, May 8, 1959, RM-2364 (secret/restricted data/declassified), pp. vii, 32.
- 231 (195) *An official “board of inquiry” ... an “important device for temporizing”*: Ibid., p. 62.
- 231 (195) “*During this delaying period the public information*”: Ibid., p. 63.
- 231 (195) “*avoid public self-implication and delay the release*”: Ibid., p. 88.
- 232 (196) *the electrical system of the W-49 warhead*: Bob Peurifoy and William L. Stevens, who both worked on the electrical system, told me the story of how it became the first warhead with an environmental sensing device. Stevens writes about the Army’s resistance to the idea in “Origins and Evolution of S2C at Sandia,” pp. 32–34.
- 232 (196) “*This warhead, like all other warheads investigated*”: Quoted in “A Summary of the Program to Use Environmental Sensing Devices to Improve Handling Safety Protection for Nuclear Weapons,” W. L. Stevens and C. H. Mauney, Sandia Corporation, July 1961 (secret/restricted data/declassified), p. 6. Another study made clear how it could be done: “A saboteur, with knowledge of the warhead can, through warhead connectors,

- operate any arm/safe switch with improvised equipment.” See “Evaluation of Warhead Safing Devices,” p. 26.
- 233 (197) *a “ handling safety device” or a “goof-proofer”*: Stevens interview.
- 233 (197) *“to hell with it”*: Peurifoy interview.
- 233 (197) *“environmental sensing device”*: Ibid.
- 233 (197) *A young physicist, Robert K. Osborne, began to worry*: My account of how the one-point safety standard developed is based on interviews with Harold Agnew and Bob Peurifoy, as well as the following documents: “Minutes of the 133rd Meeting of the Fission Weapon Committee,” Los Alamos National Laboratory, December 30, 1957; “One-Point Safety,” letter, from J. F. Ney to R. L. Peurifoy, Jr., Sandia National Laboratories, May 24, 1993; and “Origin of One-Point Safety Definition,” letter, from D. M. Olson, to Glen Otey, Sandia National Laboratories, January 6, 1993.
- 233 (198) *it could incapacitate the crew*: The goal was to avoid exposing the engine crew to an “immediate incapacitation dose” of radiation. See “Origin of One-Point Safety Definition,” p. 1.
- 234 (198) *Los Alamos proposed that the odds ... should be one in one hundred thousand*: Agnew interview.
- 234 (198) *odds of one in a million*: Ibid.
- 234 (198) *“Testing is essential for weapons development”*: Quoted in May, et al., “History of Strategic Arms Competition Part 1,” p. 235.
- 235 (198) *five hundred long-range ballistic missiles by 1961*: See “Soviet Capabilities in Guided Missiles and Space Vehicles,” NIE 11-5-58 (top secret/declassified), p. 1, in *Intentions and Capabilities*, p. 65.
- 235 (198) *outnumbering the United States by more than seven to one*: Although estimates varied, amid the controversy over the missile gap, the *New York Times* said that the United States would have about seventy long-range missiles by 1961. Cited in Richard Witkin, “U.S. Raising Missile Goals as Critics Foresee a ‘Gap,’” *New York Times*, January 12, 1959.
- 235 (199) *“entirely preoccupied by the horror of nuclear war”*: Quoted in Benjamin P. Greene, *Eisenhower, Science Advice, and the Nuclear Test Ban Debate, 1945–1963* (Stanford: Stanford University Press, 2007), p. 209.
- 235 (199) *also by defense contractors*: By early 1960, the corporate attacks on Eisenhower were blunt and well publicized. An executive at the General

- Dynamics Corporation, manufacturer of the Atlas missile, accused Eisenhower of taking “a dangerous gamble with the survival of our people.” Among other sins, Eisenhower had not ordered enough Atlas missiles. See Bill Becker, “‘Gamble’ Charged in Defense Policy,” *New York Times*, February 5, 1960.
- 235 (199) *“military-industrial complex”*: See “Transcript of President Eisenhower’s Farewell Message to Nation”, *Washington Post and Times Herald*, January 18, 1961.
- 235 (199) *“hydronuclear experiments”*: My account of these tests is based on my interview with Harold Agnew as well as this report: “Hydronuclear Experiments,” Robert N. Thorn, Donald R. Westervelt, Los Alamos National Laboratories, LA-10902-MS, February 1987.
- 235 (199) *He authorized the detonations*: George B. Kistiakowsky, the president’s chief science adviser, was not convinced, at first, that these experiments were necessary. He thought that “no reasonable amount of safety testing could prove a weapon to be absolutely safe” and that the military should just “accept the responsibility for operational use of devices that had a finite, even though exceedingly small, probability of nuclear explosion.” Kistiakowsky later agreed that the one-point safety tests should be done. See George B. Kistiakowsky, *A Scientist at the White House: The Private Diary of President Eisenhower’s Special Assistant for Science and Technology* (Cambridge, Massa.: Harvard University Press, 1976), pp. 33, 79.
- 235 (199) *“not a nuclear weapon test”*: Quoted in Thorn and Westerveldt, “Hydronuclear Experiments,” p. 5.
- 235 (199) *“Are we becoming prisoners of our strategic concept?”*: Quoted in “Memorandum of Conversation,” April 7, 1958 (top secret/declassified), NSA, p. 4.
- 236 (200) *a “bitter choice”*: Quoted in *ibid.*, p. 9.
- 236 (200) *a strategy of “flexible response”*: My description of Kissinger’s strategic views in the late 1950s is based on his book *Nuclear Weapons and Foreign Policy* (New York: Harper and Brothers, 1957), and his journal article that preceded it, “Force and Diplomacy in the Nuclear Age,” *Foreign Affairs*, vol. 34, no. 3 (April 1956), pp. 349–66. For an interesting contemporary critique of limited war theory, see P.M.S. Blackett, “Nuclear Weapons and



- Defence: Comments on Kissinger, Kennan, and King-Hall,” *International Affairs* (Royal Institute of International Affairs), vol. 34, no. 4, (October 1958), pp. 421–34.
- 236 (200) *Rules of engagement could be tacitly established*: For the proposed limits on nuclear war, see Kissinger, *Nuclear Weapons and Foreign Policy*, pp. 227–33.
- 236 (200) *a strategy of “graduated deterrence”*: Kissinger’s phrase for such a doctrine was “the graduated employment of force.” See Kissinger, “Force and Diplomacy,” p. 359.
- 237 (200) *“pause for calculation”*: Kissinger, *Nuclear Weapons and Foreign Policy*, p. 226.
- 237 (200) *“daring and leadership”*: Ibid., p. 400.
- 237 (201) *a retaliatory, second-strike weapon*: The vulnerability of Strategic Air Command bases to a Soviet missile attack gave the Navy an opportunity to expand its nuclear role. And the Army eagerly sought to do so as well. In 1959, the Army came up with a plan, “Project Iceworm,” that would hide six hundred missiles under the Greenland ice cap. The missiles would be deployed on trains, and the trains would be constantly moved along thousands of miles of railroad track hidden in tunnels almost thirty feet beneath the ice. Hiding the missiles would protect them from a Soviet surprise attack and facilitate their use as retaliatory weapons, like the Navy’s Polaris submarines. Despite the Army’s enthusiasm for deploying these “Iceman” missiles, none were ever built. See Erik D. Weiss, “Cold War Under the Ice: The Army’s Bid for a Long-Range Nuclear Role,” *Journal of Cold War Studies*, vol. 3, no. 3 (Fall 2001), pp. 31–58.
- 237 (201) *“finite deterrence”*: For the historical and intellectual framework of the dispute between the Air Force and the Navy over nuclear targeting, see David Alan Rosenberg, “U.S. Nuclear War Planning, 1945–1960,” in Desmond Ball and Jeffrey Richelson, *Strategic Nuclear Targeting* (Ithaca: Cornell University Press, 1986), pp. 35–56. Admiral Burke’s opinion on the subject is succinctly conveyed in his memo “Views on Adequacy of U.S. Deterrent/Retaliatory Forces as Related to General and Limited War Capabilities,” Memorandum for All Flag Officers, March 4, 1959 (confidential/declassified), NSA.

- 237 (201) *“Nobody wins a suicide pact”*: “Summary of Major Strategic Considerations for the 1960–70 Era,” CNO Personal Letter No. 5, Office of the Chief of Naval Operations, July 30, 1958, NSA, p. 1.
- 238 (201) *“the public mind” ... “the professional military mind”*: “The Operational Side of Air Offense,” remarks by General Curtis E. LeMay to the USAF Scientific Advisory Board, at Patrick Air Force Base, May 21, 1957 (top secret/declassified), NSA, p. 2.
- 238 (201) *“the most humane method of waging war”*: “The Air Force and Strategic Deterrence 1951–1960,” George F. Lemmer, USAF Historical Division Liaison Office, December 1967, (secret/restricted data/declassified), NSA, p. 57.
- 238 (202) *“weapons must be delivered with either very high accuracy”*: “Operational Side of Air Offense,” p. 4.
- 238 (202) *a hydrogen bomb with a yield of 60 megatons*: LeMay argued that such a bomb would have enormous value as a deterrent—and, if used, could wipe out several targets at once. He and General Power wanted to equip SAC’s B-52s with these Class A weapons. But Eisenhower refused to test or build them. See “History of the Strategic Air Command, 1 January 1958—30 June 1958,” pp. 85–88.
- 238 (202) *Until 1957 the Strategic Air Command refused to share*: See Ball and Richelson, *Strategic Nuclear Targeting*, p. 50.
- 238 (202) *hundreds of “time over target” conflicts*: See Wainstein, et al., “Evolution of U.S. Command and Control,” p. 182.
- 239 (202) *“atomic coordination machinery”*: See *ibid.*, p. 179.
- 239 (203) *“It was fatuous to think that the U.S.”*: Quoted in Richard M. Leighton, *Strategy, Money, and the New Look, 1953–1956* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 2001), p. 663.
- 239 (203) *“an all-out strike on the Soviet Union”*: The quote is Kistiakowsky’s paraphrase of what Eisenhower said. See Kistiakowsky, *A Scientist at the White House*, p. 400.
- 240 (203) *the “optimum mix”*: For the origins of the term, see Desmond Ball, “The Development of the SIOP, 1960–1983,” in Ball and Richelson, *Strategic Nuclear Targeting*, p. 61.

- 240 (203) *“atomic operations must be pre-planned”*: See “Target Coordination and Associated Problems,” memorandum from General Nathan F. Twining, Chairman, Joint Chiefs of Staff, to Neil H. McElroy, Secretary of Defense, JSC 2056/131, August 17, 1959 (top secret/declassified), NSA, p. 1147.
- 240 (204) *“exactly the same techniques”*: See “Conversation Between Admiral Arleigh Burke, Chief of Naval Operations, and William B. Franke, Secretary of the Navy,” transcript, August 12, 1960 (top secret/declassified), NSA, p. 17. It is not clear who recorded the conversation—or whether Burke knew the conversation was being taped.
- 240 (204) *“the systems will be laid”*: Ibid., p. 8.
- 240 (204) *“The grooves will be dug”*: Ibid.
- 241 (204) *“This whole thing has to be”*: Quoted in Ball and Richelson, *Strategic Nuclear Targeting*, p. 54.
- 241 (204) *as rational, impersonal, and automated as possible*: My account of the SIOP’s creation is largely based on “Development of the SIOP”; Scott C. Sagan, “SIOP-62: The Nuclear War Plan Briefing to President Kennedy,” *International Security*, vol. 12, no. 1 (Summer 1987), pp. 22–51; “SIOP-62 Briefing: The JCS Single Integrated Operational Plan—1962 (SIOP-62), (top secret/ declassified), Ibid., pp. 41–51; “History of the Joint Strategic Target Planning Staff: Background and Preparation of SIOP-62,” History and Research Division, Headquarters, Strategic Air Command, 1963 (top secret/declassified), NSA; “History of the Joint Strategic Target Planning Staff: Preparation of SIOP-63,” History and Research Division, Headquarters, Strategic Air Command, January 1964 (top secret/declassified), NSA; and “Strategic Air Planning and Berlin (Kaysen Study),” memorandum for General Maxwell Taylor, Military Representative to the President, from Carl Kaysen, Special Assistant to McGeorge Bundy, National Security Adviser, September 5, 1961 (top secret/declassified), NSA.
- 241 (204) *the Air Force’s Bombing Encyclopedia*: For the origins and the nomenclature of this unusual reference book, see Lynn Eden, *Whole World on Fire: Organizations, Knowledge & Nuclear Weapons Devastation* (Ithaca: Cornell University Press, 2004), pp. 107–9.

- 241 (204) *a compendium of more than eighty thousand potential targets*: Cited in “SIOP-62 Briefing,” p. 44.
- 241 (204) *twelve thousand candidates in the Soviet Union, the Eastern bloc*: Cited in “Preparation of SIOP-63,” p. 18.
- 241 (204) *A “target weighing system”*: See “Background and Preparation of SIOP-62,” p. 19.
- 241 (204) *total value of five million points*: Cited in “Strategic Air Planning and Berlin,” Annex B, p. 2.
- 241 (205) *the “clobber factor”*: See “Preparation of SIOP-63,” p. 34.
- 241 (205) *the odds of a target being destroyed ... at least 75 percent*: Cited in “Strategic Air Planning and Berlin,” Annex B, p. 2.
- 241 (205) *a Jupiter missile, a Titan missile, an Atlas missile*: See *ibid.*, p. 4.
- 242 (205) *The “alert force” ... the “full force”*: *Ibid.*
- 242 (205) *“Tactics programmed for the SIOP”*: “SIOP-62 Briefing,” p. 48.
- 242 (205) *attack the Soviet Union “front-to-rear”*: For a description of the “‘front-to-rear’ policy,” see “Air Force and Strategic Deterrence,” p. 56.
- 242 (205) *a tactic called “bomb as you go”*: See “SIOP-62 Briefing,” p. 48.
- 242 (205) *nuclear weapons solely for city busting*: The quote is from Air Marshal Sir George Mills, who made clear in 1955 that the British much preferred destroying “morale targets”—Soviet cities, not air fields. “Our aim in retaliation,” Mills wrote, “is to hit him where it really hurts.” See Ken Young, “A Most Special Relationship: The Origins of Anglo-American Nuclear Strike Planning,” *Journal of Cold War Studies*, vol. 9, no. 2, 2007, pp. 5–31. The quotes are from pages 11 and 24.
- 242 (205) *three air bases, six air defense targets, and forty-eight cities*: Cited in *ibid.*, p. 27.
- 242 (206) *“unnecessary and undesirable overkill”*: Quoted in Ball and Richelson, *Strategic Nuclear Targeting*, p. 55.
- 243 (206) *enough “megatons to kill 4 and 5 times over”*: Quoted in *Ibid.*
- 243 (206) *“just one whack—not ten whacks”*: Quoted in *ibid.*, p. 56.
- 243 (206) *“I believe that the presently developed SIOP”*: “Annex: Extract from Memorandum for the President from the Special Assistant to the President for Science and Technology, dated 25 November 1960,” in “Note by the

- Secretaries to the Joint Chiefs of Staff on Strategic Target Planning,”  
January 27, 1961 (top secret/declassified), NSA, p. 1913.
- 243 (206) *“a 100 percent pulverization of the Soviet Union”*: Quoted in “Discussion at the 387th Meeting of the National Security Council, Thursday, November 20, 1958” (top secret/declassified), NSA, p. 5.
- 243 (206) *“There was obviously a limit”*: Ibid., p. 5.
- 243 (206) *3,729 targets ... more than 1,000 ground zeros*: Cited in “Strategic Air Planning and Berlin,” Annex B, p. 2.
- 243 (206) *3,423 nuclear weapons*: Ibid., p. 4.
- 243 (206) *About 80 percent were military targets*: Cited in “SIOP-62 Briefing,” p. 50.
- 243 (206) *295 were in the Soviet Union and 78 in China*: See “Strategic Air Planning and Berlin,” Annex B, p. 2.
- 243 (206) *54 percent of the Soviet Union’s population and about 16 percent of China’s*: See Ibid., Annex A, p. 2; Annex B, p. 12.
- 243 (206) *roughly 220 million people*: The population of the Soviet Union was about 210 million at the time; the population of China about 682 million.
- 244 (207) *Eisenhower agreed to let high-ranking commanders decide*: For the best account of how the military gained the authority to initiate the use of nuclear weapons, see Roman, “Ike’s Hair-Trigger,” pp. 121–164.
- 244 (207) *“something foolish down the chain of command”*: Quoted in *ibid.*, p. 156.
- 244 (207) *“very fearful of having written papers on this matter”*: The quote is a paraphrase by the author of the memo and can be found in “Memorandum of Conference with the President, June 27, 1958,” A. J. Goodpaster (top secret/declassified), NSA, p. 3.
- 244 (207) *“It is in the U.S. interest to maintain”*: The quote is a paraphrase by the author of the memo and can be found in “Memorandum of Conference with the President, December 19, 1958,” John S. D. Eisenhower (top secret/declassified), NSA, p.1.

## MIT BRECHSTANGEN

- 246 (208) *Colonel John T. Moser and his wife*: Interview with Colonel John T. Moser.
- 246 (209) *The two had to rendezvous at a precise location*: For the details of this tricky but essential procedure, see Richard K. Smith, *Seventy-Five Years of Inflight Refueling: Highlights, 1923–1998* (Washington, D.C.: Air Force History and Museums Program, 1998), pp. 38–9.
- 248 (212) *Leavitt made it clear*: Interview with General Lloyd R. Leavitt.
- 248 (213) *Of the 119 West Pointers who graduated from flight school*: Cited in Lloyd R. Leavitt, *Following the Flag: An Air Force Officer Provides an Eyewitness View of Major Events and Policies During the Cold War* (Maxwell Air Force Base, AL: Air University Press, 2010), p. 57.
- 251 (213) *“Landing the U-2,” Leavitt wrote*: Ibid., p. 175.
- 251 (213) *Of the thirty-eight U-2 pilots ... eight died flying the plane*: See *ibid.*, p. 185.
- 251 (215) *“ordered everyone to evacuate the control center”*: Moser interview.
- 258 (219) *When Ben Scallorn first reported to Little Rock*: Interview with Colonel Ben G. Scallorn.
- 258 (219) *4.5 million pounds of steel*: About 2,255 tons of steel were used. Cited in Stumpf, *Titan II*, p. 112.
- 258 (219) *30 million pounds of concrete*: About 7,240 cubic yards of concrete were used—and a cubic yard of concrete weighs about two tons. Cited in *ibid.*
- 258 (219) *a management practice known as “concurrency”*: The great advantage of concurrency was that it allowed new weapon systems to be developed quickly; the main disadvantage was that those weapons tended to be unreliable and often didn’t work. See Stephen Johnson, *The United States Air Force and the Culture of Innovation: 1945–1965* (Washington, D.C.: Air Force History and Museums Program, 2002), pp. 19–22, 89–94.
- 258 (219) *one of the largest construction projects ever undertaken by the Department of Defense*: For details of how the silos and launch complexes were built, see Joe Alex Morris, “Eighteen Angry Men: The Hard-Driving Colonels Who Work Against Crucial Deadlines to Ready Our Missile Launching Sites,” *Saturday Evening Post*, January 13, 1962; John C. Lonnquest and David F. Winkler, *To Defend and Deter: The Legacy of the United States Cold War Missile Program* (Washington, D.C.: Department of Defense,

- Legacy Resource Management Program, Cold War Project, 1996), pp. 77–88; and Stumpf, *Titan II*, pp. 99–127.
- 259 (220) *an area extending for thirty-two thousand square miles*: The launch sites of the 91st Strategic Missile Wing at Minot Air Force Base were set amid 8,500 square miles—about 12 percent of the land in North Dakota. And the sites of the 341st Strategic Missile Wing at Malmstrom Air Force Base were spread out across 23,500 square miles of Montana. See “Fact Sheet,” 91st Missile Wing—Minot Air Force Base, April 14, 2011; and “Fact Sheet,” 341st Missile Wing—Malmstrom Air Force Base, August 2, 2010.
- 259 (220) *a population of about ten thousand*: Cited in “History of Air Research and Development Command, July–December 1960” Volume III, Historical Division, Air Research & Development Command, United States Air Force (n.d.), (secret/restricted data/declassified), p. 19.
- 259 (220) *“Like any machine ... they don’t always work”*: Quoted in “USAF Ballistic Missile Programs, 1962–1964,” Bernard C. Nalty, USAF Historical Division Liaison Office, April 1966 (top secret/declassified), NSA, p. 47.
- 259 (220) *the Snark*: For a wonderful account of this ill-fated missile, see Kenneth P. Werrell, *The Evolution of the Cruise Missile* (Maxwell Air Force Base, AL: Air University Press, 1985), pp. 82–96.
- 260 (220) *missed by an average of twenty miles or more*: More important, only one out of three Snarks were likely to get off the ground. See *ibid.*, pp. 95–96.
- 260 (220) *a Snark that was supposed to fly no farther than Puerto Rico*: For the story of the runaway missile, see J. P. Anderson, “The Day They Lost the Snark,” *Air Force Magazine*, December 2004, pp. 78–80.
- 260 (221) *The Army’s Redstone missile*: Although its range was short, the missile was so reliable that it was used by NASA to launch America’s first astronaut into space. See “History of the Redstone Missile System,” John W. Bullard, Historical Division, Army Missile Command, AMC 23 M, October 15, 1965.
- 260 (221) *Launched from NATO bases in West Germany*: Bob Peurifoy told me about the mismatch between the yield of the Redstone’s warhead and the distance that it could fly.
- 260 (221) *It would take at least fifteen minutes to launch any of the missiles*: For the technical and operational details of the Thor, see Stephen Twigge and Len

- Scott, *Planning Armageddon: Britain, the United States and the Command of Western Nuclear Forces, 1945–1964* (Amsterdam: Harwood Academic Publishers, 2000), pp. 109–12.
- 261 (221) *as much as two days to complete its mission*: Ibid., p. 111.
- 261 (221) *useful for a surprise attack*: For an excellent summary of the inherent flaws of Thor and Jupiter missiles, the intermediate-range missiles that the United States shared with its NATO allies, see Philip Nash, *The Other Missiles of October: Eisenhower, Kennedy, and the Jupiters, 1957–1963* (Chapel Hill, NC: University of North Carolina, 1997), pp. 80–85.
- 261 (222) *the Atlas missile loomed as America’s great hope*: For the definitive account of the Atlas program, cowritten by one of its managers, see Chuck Walker, with Joel Powell, *ATLAS: The Ultimate Weapon by Those Who Built It* (Ontario, Canada: Apogee Books Production, 2005).
- 261 (222) *a “fire waiting to happen”*: For the dangers of the Atlas and Titan propellants, see Charlie Simpson, “LOX and RP1—Fire Waiting to Happen,” *Association of Air Force Missileers Newsletter*, vol. 14, no. 3 (September 3, 2006). Colonel Simpson is the executive director of the Association of Air Force and worked with Titan I missiles.
- 261 (222) *a temperature of -297 degrees Fahrenheit*: Cited in Walter, *ATLAS*, Appendix D, p. 281.
- 261 (222) *the odds of an Atlas missile hitting a target ... no better than fifty-fifty*: The estimate was sheepishly offered by Major General Thomas P. Gerrity, Commander, Ballistic Systems Division, Air Force Systems Command. Another officer optimistically predicted that the reliability of the Atlas would reach 85 percent. Instead, all of the missiles were deactivated and removed from service within a few years. For the reliability estimates, see “Missile Procurement, Air Force,” pp. 529–30.
- 262 (222) *General Thomas Power ... thought the odds were closer to zero*: See Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force, 1945–1960*, (Washington, D.C.: Office of Air Force History, 1990), p. 216.
- 262 (222) *During a test run of the first Titan silo*: For more details of the accident, see Stumpf, *Titan II*, pp. 23–26.



- 262 (222) *about 170,000 pounds of liquid oxygen and fuel:* The missile was fully loaded with propellants.
- 262 (223) *Donald Quarles was one of the leading skeptics:* A few months before his death, Quarles was strongly attacked by the columnist Joseph Alsop for opposing new missile programs and allowing the United States to fall behind the Soviets. See Joseph Alsop, "Mister Missile Gap," *Washington Post*, April 24, 1959.
- 263 (223) *how to bring the warhead close to its target:* My description of ballistic missile guidance systems is based on a fine magazine article published more than half a century ago, Maya Pines, "The Magic Carpet of Inertial Guidance," *Harper's*, March 1962; a training manual for Titan II launch officers, "Missile Launch/Missile Officer (LGM-25): Missile Systems," Student Study Guide 3OBR1821F/3121F-V1 through 4, Volume I of II, Department of Missile and Space Training, Sheppard Technical Training Center, September 1968; and an extraordinary book about how missiles hit their targets, Donald MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: MIT Press, 1993).
- 263 (223) *burned for only the first five minutes of flight:* During the booster phase, the first-stage engine of the Titan II fired for about 165 seconds; during the sustainer phase, the second-stage engine fired for about 125 seconds; and during the Vernier Stage, the two small solid propellant engines fired for about 10 seconds. See "Missile Launch/Missile Officer (LGM-25)," p. 3.
- 263 (224) *about 80 percent of the warheads within roughly a mile of their targets:* Cited in MacKenzie, *Inventing Accuracy*, p. 122.
- 264 (224) *a leading role in the miniaturization of computers:* See *ibid.*, pp. 159–61, 206–7; Edwards, *Closed World*, pp. 63–5.
- 264 (224) *all of the integrated circuits in the United States:* See MacKenzie, *Inventing Accuracy*, p. 207. In 1965, the Pentagon was buying 72 percent of the integrated circuits, and the proportion being used in military applications did not fall below half until 1967. See Table 6 in Gregory Hooks, "The Rise of the Pentagon and U.S. State Building: The Defense Program as Industrial Policy," *American Journal of Sociology*, vol. 96, no. 2 (September 1990), p. 389.

- 264 (225) *It had about 12.5 kilobytes of memory:* This is a rough estimate, used for the sake of simplicity. The Titan II missile's onboard guidance computer could store 100,224 binary bits. They were stored on a magnetic drum memory assembly with 58 tracks. Each track held 64 words (or "bytes") that contained 27 bits. For the sake of comparison, I have converted those 27-bit bytes into today's more commonly used 8-bit bytes. By that measure, the Titan II onboard computer had about 12.5 kilobytes of memory. For the specifications of the computer, see "Missile Launch/Missile Officer (LGM-25)," p. 24. I am grateful to Chuck Penson, Bob Peurifoy, Richard Peurifoy, and Steve Peurifoy for helping me with these calculations.
- 264 (224) *more than five million times that amount:* Many smartphones now have 64 gigabytes of memory. A gigabyte is equivalent to about 1 million kilobytes. The comparison between the 12.5-kilobyte memory of a Titan II computer and the 64-gigabyte memory of a smartphone is inexact. But it still conveys an important point: even the rudimentary computing device aboard the Titan II could guide a nuclear warhead almost halfway around the world with remarkable accuracy.
- 265 (225) *the first missile to employ an inertial guidance system:* For the Nazi efforts in this field, see MacKenzie, *Inventing Accuracy*, pp. 44–60.
- 265 (225) *the Nazi scientists who invented it were recruited:* Dr. Walter Haeussermann, who played a large role in developing the guidance system of the V-2, was brought to the United States under Project Paperclip and reunited with his former employer, Wernher von Braun. Haeussermann later worked on the guidance systems of the Redstone and Jupiter missiles, left the Army to work for NASA, later headed the Astrionics Laboratory at the Marshall Space Center, and helped devise the mechanisms that guided American astronauts safely to the moon. See Dennis Hevesi, "Walter Hauessermann, Rocket Scientist, Dies at 96," *New York Times*, December 17, 2010.
- 265 (225) *Circular Error Probable ... of less than a mile:* See MacKenzie, *Inventing Accuracy*, p. 131.
- 265 (225) *miscalculated by just 0.05 percent:* During the last fifteen minutes of the Titan II warhead's reentry, it traveled at a speed of about 16,000 miles per hour. It would cover a distance of about 4,000 miles in those fifteen

minutes. A measurement error of 0.05 percent would add or subtract about 20 miles from the distance traveled. For the speed of reentry, see Penson, *Titan II Handbook*, p. 169. Maya Pines made a similar calculation in “Magic Carpet of Inertial Guidance,” but with a somewhat different result.

- 265 (225) *The accuracy of a Titan II launch:* My description of a Titan II missile’s launch, trajectory, and flight is based on information found in Penson, *Titan II Handbook*, pp. 118–39, 169; Stumpf, *Titan II*, pp. 177–8; and “Final Titan II Operational Data Summary,” Rev 3, TRW Space Technology Laboratories, September 1964 p. 3-1. Some of the numbers differ slightly in these sources. For example, Chuck Penson says the missile began to rise 58 seconds after the keys were turned; David Stumpf says 59.2 seconds. I have tried to convey the gist of how a Titan II launch would have unfolded. Penson’s account is especially vivid and detailed.
- 266 (226) *about twenty-three thousand feet per second, faster than a speeding bullet:* An object going 16,000 miles per hour is traveling about 4.44 miles per second—roughly 23,467 feet per second. The velocity of bullets fired from a typical handgun ranges from about 800 to 1,200 feet per second at a distance of 50 yards. The speed of rifle bullets is higher, reaching as much as 4,000 feet per second.
- 266 (226) *surface temperatures of about 15,000 degrees Fahrenheit:* Although temperatures that high might be encountered briefly, the strong shock wave preceding a warhead as it falls will dissipate a great deal of that heat in the atmosphere. Cited in “Ballistic Missile Staff Course Study Guide,” 4315th Combat Crew Training Squadron, Strategic Air Command, Vandenberg Air Force Base, July 1, 1980, p. 3–1.
- 266 (226) *hotter than the melting point of any metal:* Tungsten’s melting point is the highest—6,170 degrees Fahrenheit. Cited in Stumpf, *Titan II*, p. 56.
- 266 (226) *On the way up, a barometric switch closed ... On the way down, an accelerometer ignited:* I learned these details from a weapon designer who worked on the W-53 warhead.
- 266 (226) *set for an airburst ... at an altitude of fourteen thousand feet:* Cited in Penson, *Titan II Handbook*, p. 135.
- 267 (227) *At first, perhaps 70 to 75 percent ... were expected to hit their targets:* Cited in “Missile Procurement,” p. 532.

- 267 (227) *that proportion would rise to 90 percent*: Cited in *ibid*.
- 267 (227) *“the biggest guns in the western world”*: “Nuclear ‘Guns’ Ready, Aimed at Likely Foes,” *Los Angeles Times*, June 22, 1964.
- 267 (227) *The first launch crews had to train with cardboard mock-ups*: For the challenges that some of the first crews faced, see Grant E. Secrist, “A Perspective on Crew Duty in the Early Days, the 308th SMW,” *Association of Air Force Missileers Newsletter*, vol. 13, No. 4, December 2005, pp. 4–6.
- 269 (229) *Sergeant Donald V. Green was serving as a referee*: Interview with Donald V. Green.
- 269 (230) *General LeMay liked to run these tests*: They were prominently featured in the movie *Strategic Air Command* and in the *Life* magazine profile of LeMay, “Toughest Cop of the Western World.” The author and historian James Carroll described how his father, a high-ranking security officer at the Pentagon, spent years attempting acts of “faux sabotage” against LeMay, as part of a friendly rivalry. See James Carroll *House of War: The Pentagon and the Disastrous Rise of American Power* (Boston: Mariner Books, 2006), pp. 214–19.
- 276 (235) *“Scallorn, just be quiet”*: Quoted in Scallorn interview and Moser interview.
- 276 (235) *“Roger, General”*: Quoted in *ibid*.
- 276 (235) *“Little Rock, this is Martin-Denver”*: Carnahan’s recommendation that nothing be done is the only quote in the entire three-volume accident report that comes from a tape recording of discussions on the Missile Potential Hazard Net. The quote is long, it’s verbatim—and it absolves Martin Marietta of responsibility for what later went wrong. The recording was made at Martin-Denver. See “Report, Major Missile Accident, Titan II Complex 374-7,” Testimony of Charles E. Carnahan, Tab U-11, pp. 1–2.
- 283 (241) *“It’s hot as hell”*: Quoted in “Report, Major Missile Accident, Titan II Complex 374-7,” Kennedy statement, Tab U-46, p. 10.

## VIERTER TEIL: AUSSER KONTROLLE

### ENTHAUPTUNGSSCHLAG

- 286 (245) *a B-52 bomber took off from Seymour Johnson Air Force Base:* My account of the accident is based on interviews with Bob Peurifoy and Bill Stevens, as well as on documents that have been released through the Freedom of Information Act. See “Summary of Nuclear Weapon Incidents (AF Form 1058) and Related Problems—January 1961,” *Airmunitions Letter*, No. 136-11-56G, Headquarters, Ogden Air Material Area, April 18, 1961 (secret/restricted data/declassified), pp. 1–27; and “Official Observer’s Report, Air Accident, Goldsboro, North Carolina,” Ross B. Speer, AEC/ALO, February 16, 1961 (secret/restricted data /declassified). A good explanation of why the accident was so dangerous can be found in a memo written by Parker F. Jones, the supervisor of Sandia’s Nuclear Weapon Safety Department: “Goldsboro Revisited, or How I Learned to Mistrust the H-Bomb, or To Set the Record Straight,” Parker F. Jones, SFRD Memo, SNL 1651, October 22, 1969 (secret/restricted data/declassified). Joel Dobson offers the best description of the accident itself and the fate of the crew in *The Goldsboro Broken Arrow: The Story of the 1961 B-52 Crash, the Men, the Bombs, the Aftermath* (Raleigh, NC: Lulu, 2011). But Dobson’s book is less reliable about the inner workings of the weapons.
- 286 (245) *Mattocks managed to jump through the escape hatch:* Mattocks should have been killed immediately by the tail of the plane. But the plane was breaking apart as he left it, and the tail was already gone. The B-52 exploded right after his parachute deployed, briefly collapsing it. He landed on a farm in the middle of the night, assured its frightened owners that he wasn’t a Martian, got a ride to Seymour Johnson Air Force Base—and got arrested by the guards at the front gate. They had not been informed of the accident, and he couldn’t produce any military identification. One of the other crew members who safely escaped from the plane, Captain Richard Rardin, found a ride to the base and arrived at the gate not long afterward. When the

- guards threatened to arrest Rardin, too, Mattocks managed to convince them that the two men were indeed Air Force officers and that a B-52 had just fallen from the sky. See Dobson, *Goldsboro Broken Arrow*, pp. 55–60.
- 287 (246) *The Air Force assured the public*: See Noel Yancey, “In North Carolina: Nuclear Bomber Crashes; 3 Dead,” *Fort Pierce News Tribune* (Florida), January 24, 1961.
- 287 (246) *The T-249 control box and ready/safe switch ... had already raised concerns at Sandia*: Interviews with Peurifoy and Stevens. Some of the limitations of the T-249, known as the Aircraft Monitor and Control Box, had been addressed two years earlier in “A Survey of Nuclear Weapon Safety Problems,” pp. 19–23.
- 288 (247) *all of the weapons were armed*: Stevens interview. See also Stevens, “Origins and Evolution of S2C at Sandia,” p. 60.
- 288 (247) *A seven-month investigation by Sandia*: See *ibid.*
- 288 (247) “*It would have been bad news—in spades*”: “Goldsboro Revisited,” p. 1.
- 288 (247) “*One simple, dynamo-technology, low-voltage switch*”: *Ibid.*, p. 2.
- 288 (247) *the groundburst of that 4-megaton bomb in Goldsboro*: The amount of fallout would not have been as great as that produced by the far more powerful Bravo test. But the Goldsboro bomb could have spread deadly radioactive material across a large area of the northeastern United States.
- 288 (247) “*pay any price, bear any burden*”: “Text of Kennedy’s Inaugural Outlining Policies on World Peace and Freedom,” *New York Times*, January 21, 1961.
- 288 (247) *The story scared the hell out of him*: Interview with Robert S. McNamara.
- 289 (248) *A B-47 carrying a Mark 39 bomb had caught fire*: Peurifoy and Stevens interviews. See also *Airmunitions Letter*, June 23, 1960, p. 37, and Maggelet and Oskins, *Broken Arrow*, pp. 113–18.
- 289 (248) *A B-47 ... caught fire on the runway at Chennault Air Force base*: See *Airmunitions Letter*, June 23, 1960, p. 53.
- 289 (248) *In the skies above Hardinsburg, Kentucky*: See *Airmunitions Letter*, Headquarters, Ogden Air Material Area, No. 136-11-56B, June 29, 1960 (sectet/restricted data/declassified, pp. 13–46, Maggelet and Oskins, *Broken Arrow*, pp. 129–32).
- 289 (248) *a “crunching sound”*: Quoted Maggelet and Oskins, *Broken Arrow*, p. 132.

- 289 (248) *At an air defense site in Jackson Township:* For details of the BOMARC accident, see “Report of Special Weapons Incident ... Bomarc Site, McGuire AFB, New Jersey,” 2702nd Explosive Ordnance Disposal Squad, United States Air Force, Griffiss Air Force Base, New York, June 13, 1960 (secret/restricted data /declassified); *Airmunitions Letter*, No. 136-11-56C, Headquarters, Ogden Air Material Area, September 8, 1960 (secret/restricted data/declassified; and George Barrett, “Jersey Atom Missile Fire Stirrs Brief Radiation Fear,” *New York Times*, June 8, 1960.
- 289 (249) *An Air Force security officer called the state police:* See “Jersey Atom Missile Fire.” 290 (249) *Fallout from the BOMARC’s 10-kiloton warhead:* See “Civil Defense Alerted in City,” *New York Times*, June 8, 1960.
- 290 (249) *The accidents in North Carolina and Texas worried Robert McNamara the most:* McNamara interview. See also “Memorandum of Conversation (Uncleared), Subject: State-Defense Meeting on Group I, II, and IV Papers,” January 26, 1963 (top secret/declassified), NSA, p. 12.
- 290 (249) *“bankruptcy in both strategic policy and in the force structure”:* “Robert S. McNamara Oral History Interview—4/4/1964,” John F. Kennedy Oral History Collection, John F. Kennedy Presidential Library and Museum, p. 5.
- 291 (249) *“The Communists will have a dangerous lead”:* Quoted in Desmond Ball, *Politics and Force Levels: The Strategic Missile Program of the Kennedy Administration* (Berkeley: University of California Press, 1980), p. 18. Although Ball’s work was written before the declassification of many important national security documents from the Kennedy era, the book’s central arguments are still convincing. I also learned a great deal about the Kennedy administration’s aims from *How Much Is Enough? 1961–1969: Shaping Defense Program* (Santa Monica, CA.: RAND Corporation, 1971), by Alain C. Enthoven and K. Wayne Smith. Enthoven was one of McNamara’s most brilliant advisers. For Kennedy’s attacks on the strategic thinking of the Eisenhower administration, see Christopher A. Preble, “‘Who Ever Believed in the ‘Missile Gap’?’: John F. Kennedy and the Politics of National Security,” *Presidential Studies Quarterly*, vol. 33, no. 4 (December 2003), pp. 801–26.

- 291 (250) *"We have been driving ourselves into a corner"*: Quoted in William W. Kaufmann, *The McNamara Strategy* (New York: Harper & Row, 1964), p. 40.
- 291 (250) *General Maxwell D. Taylor's book, The Uncertain Trumpet*: Taylor argued that the United States needed "a capability to react across the entire spectrum of possible challenge, for coping with anything from general atomic war to infiltrations and aggressions." He was later a major architect of the Vietnam War. See Maxell D. Taylor, *The Uncertain Trumpet* (New York: Harper & Brothers, 1960), p. 6.
- 291 (250) *"The record of the Romans made clear"*: "Summary of President Kennedy's Remarks to the 496th Meeting of the National Security Council," January 18, 1962 (top secret/declassified), in United States Department of State, *Foreign Relations of the United States, 1961–1963, Volume VIII, National Security Policy* (Washington, D.C.: U.S. Government Printing Office, 1996), p. 240.
- 292 (250) *The chief of naval operations, Admiral Arleigh Burke, warned*: Western Europe would suffer radiological effects from a massive American attack on the Soviet Union, but South Korea was likely to receive even worse fallout. See "Chief of Naval Operations Cable to Commander-in-Chief Atlantic Fleet, Commander-in-Chief Pacific Fleet, Commander-in-Chief U.S. Naval Forces Europe," November 20, 1960 (top secret/declassified), NSA, p. 1.
- 292 (251) *"whiz kids," "defense intellectuals," "the best and the brightest"*: David Halberstam's book on this highly self-confident group remains authoritative: *The Best and the Brightest* (New York: Ballantine Books, 1992).
- 292 (251) *WSEG Report No. 50*: "Evaluation of Strategic Offensive Weapons Systems," Weapon Systems Evaluation Group Report No. 50, Washington, D.C., December 27, 1960 (top secret/ restricted data/declassified), NSA.
- 293 (251) *the annual operating costs of keeping a B-52 bomber on ground alert*: See *ibid.*, Enclosure "F," p. 19.
- 293 (251) *America's command-and-control system was so complex*: Long excerpts from Enclosure "C," the section of WSEG R-50 on command and control, can be found in Wainstein, et al. "Evolution of U.S. Strategic Command and Control," pp. 239–47.



- 293 (251) *By launching a surprise attack on five targets*: Ibid., p. 243.
- 293 (252) *By hitting nine additional targets*: Ibid., p. 242.
- 293 (252) *a 90 percent chance of success*: Cited in *ibid.*
- 293 (252) *only thirty-five Soviet missiles*: Cited in *Ibid.*
- 293 (252) *Four would be aimed at the White House*: Ibid., p. 243.
- 293 (252) *“Under surprise attack conditions”*: Quoted in *ibid.*, p. 239.
- 294 (252) *“a one-shot command, control, and communication system”*: Ibid., p. 284.
- 294 (253) *the warning time would be zero*: Cited in *Ibid.*, p. 241.
- 294 (253) *During a tour of NORAD headquarters in Colorado Springs*: My account of this false alarm is based on “‘Missile Attack’ Terror Described,” *Oakland Tribune*, December 11, 1960; “When the Moon Dialed No. 5, They Saw World War III Begin,” *Express and News* (San Antonio), December 11, 1960; John G. Hubbell, “You Are Under Attack!, The Strange Incident of October 5,” *Reader’s Digest*, April 1961, pp. 37–39; and Donald MacKenzie, *Mechanizing Proof: Computing, Risk, and Trust* (Cambridge, MA: MIT Press, 2001), pp. 23–4. MacKenzie obtained an oral history interview with General Kuter that largely confirmed the contemporary accounts of the incident.
- 295 (253) *a 99.9 percent certainty*: Cited in “‘You Are Under Attack!’”.
- 295 (253) *“Chief, this is a hot one”*: Quoted in MacKenzie, *Mechanizing Proof*, p. 23.
- 295 (253) *“Where is Khrushchev?”*: Quoted in “‘You Are Under Attack!’”.
- 295 (254) *They recalled a sense of panic at NORAD*: Percy later wondered what sort of decision might have been made if the radar signals hadn’t been recognized to be a false alarm. See Einar Kringlen, “The Myth of Rationality in Situations of Crisis,” *Medicine and War*, Vol. I (1985), p. 191.
- 296 (254) *“There is no mechanism for nor organization charged with”*: Quoted in Wainstein, et al., “Evolution of U.S. Strategic Command and Control,” p. 243.
- 296 (255) *“No other target system can at present offer”*: Quoted in *ibid.*, p. 246.
- 296 (255) *“We have been concerned with the vulnerability”*: McNamara learned within weeks of taking office that the command-and-control problems in Europe were severe. These quotes are taken from a report submitted to him in the fall of 1961 by General Earle E. Partridge, a retired Air Force officer

- who'd been asked to head an investigation of command-and-control issues. "Interim Report on Command and Control in Europe," National Command and Control Task Force, October 1961 (top secret/declassified), NSA, p. 2.
- 297 (255) *All of NATO's command bunkers ... could easily be destroyed*: See *ibid.*
- 297 (255) *At best, NATO commanders might receive five or ten minutes of warning*: See *ibid.*, p. 4.
- 297 (255) *the NATO communications system was completely unprotected*: See *ibid.*, pp. 3–4.
- 297 (255) *the president could not expect to reach any of NATO's high-ranking officers*: See *ibid.*, p. 5.
- 297 (255) *"It is imperative that each commander knows"*: *Ibid.*
- 297 (256) *"Not only could we initiate a war, through mistakes"*: *Ibid.*, p. 6.
- 298 (256) *"A subordinate commander faced with a substantial Russian military action"*: "Memorandum from the President's Special Assistant for National Security Affairs (Bundy) to President Kennedy," January 30, 1961 (top secret/declassified), in *Foreign Relations of the United States, 1961–1963, Volume VIII, National Security Policy*, p. 18.
- 298 (256) *a top secret report, based on a recent tour of NATO bases*: See "Report of Ad Hoc Subcommittee on U.S. Policies Regarding Assignment of Nuclear Weapons to NATO; Includes Letter to President Kennedy and Appendices," Joint Committee on Atomic Energy, Congress of the United States," February 11, 1961 (secret/restricted data/declassified), NSA.
- 298 (257) *"he almost fell out of his chair"*: The adviser, Thomas Schelling, is quoted in Webster Stone, "Moscow's Still Holding," *New York Times*, September 18, 1988.
- (299) *257 The Joint Committee on Atomic Energy had been concerned*: My description of the committee's tour of NATO sites and the development of Permissive Action Links is based on "Report on U.S. Policies Regarding Assignment of Nuclear Weapons to NATO"; "Letter, From Harold M. Agnew, to Major General A. D. Starbird, Director of Military Applications, U.S. Atomic Energy Commission," January 5, 1961 (Secret/Restricted Data/declassified); Clinton P. Anderson, with Milton Viorst, *Outsider in the Senate: Senator Clinton Anderson's Memoirs* (New York: World Publishing Company, 1970), pp. 165–73; "Command and Control Systems for Nuclear

Weapons: History and Current Status,” System Development Department I, Sandia Laboratories, SLA-73-0415, September 1973 (secret/restricted data/declassified); “PAL Control of Theater Nuclear Weapons,” M. E. Bleck, P. R. Souder, Command and Control Division, Sandia National Laboratories, SAND82-2436, March 1984 (secret/formerly restricted data/declassified); Peter Stein and Peter Feaver, *Assuring Control of Nuclear Weapons: The Evolution of Permissive Action Links* (Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University, and University Press of America, 1987); Stevens, “Origins and Evolution of S2C at Sandia,” pp. 50–52; and my interview with Harold Agnew, who went on the European trip and played an important role in the adoption of PALs.

- 299 (257) “*I have always been of the belief*”: The president’s news conference of February 3, 1960, in *Public Papers of the Presidents of the United States: Dwight D. Eisenhower, Containing the Public Messages and Statements of the President, January 1, 1960 to January 20, 1961* (Washington, D.C.: Office of the Federal Register, 1961), p. 152.
- 299 (257) “*an essential element*” of the NATO stockpile: Quoted in Anderson, *Outsider in the Senate*, p. 170.
- 299 (258) *a private understanding with Norstad*: See Trachtenberg *Constructed Peace*, p. 170.
- 300 (258) “*nearly wet my pants*”: Agnew interview.
- 301 (258) “*All [the Italians] have to do is hit him on the head*”: Transcript, Executive Session, Joint Committee on Atomic Energy, Meeting No. 87-1-4, February 20, 1960, NSA, p. 73.
- 301 (259) “*There were three Jupiters setting there*”: Ibid, p. 66.
- 301 (259) “*Non-Americans with non-American vehicles*”: Ibid, p. 47.
- 302 (259) “*The prime loyalty of the guards, of course*”: “Report on U.S. Policies Regarding Assignment of Nuclear Weapons to NATO,” p. 33.
- 302 (260) *French officers sought to gain control of a nuclear device*: I first learned about the attempt from Thomas Reed, a former secretary of the Air Force and adviser to President Ronald Reagan. Reed briefly mentions the episode in a book that he wrote with Danny B. Stillman, a former director of the Los Alamos Technical Intelligence Division: *The Nuclear Express: A Political*

- History of the Bomb and Its Proliferation* (Minneapolis: Zenith Press, 2009), pp. 79–80. The story is told in much greater detail by Bruno Tertrais in “A Nuclear Coup? France, the Algerian War and the April 1961 Nuclear Test,” *Fondation pour la Recherche Stratégique*, Draft, October 2, 2011. 260 “*Refrain from detonating your little bomb*”: Quoted in Tertrais, “A Nuclear Coup?,” p. 11.
- 302 (260) “*the dumping ground for obsolete warheads*”: “Report on U.S. Policies Regarding Assignment of Nuclear Weapons to NATO,” p. 45.
- 302 (260) *Holifield estimated that about half of the Jupiters*: Transcript, Executive Session, Joint Committee on Atomic Energy, Meeting No. 87-1-4, p. 82.
- 303 (260) *The Chairman of the Joint Chiefs of Staff admitted*: See Nash, *Other Missiles of October*, p. 56.
- 303 (260) “*It would have been better to dump them in the ocean*”: Quoted in *ibid.*, p. 3.
- 303 (260) *The Mark 7 atomic bombs carried by NATO fighters*: Agnew, Stevens, Peurifoy interviews.
- 303 (261) *amazed to see a group of NATO weapon handlers pull the arming wires out*: Agnew interview. The bombs lacked trajectory-sensing switches and therefore could detonate without having to fall from a plane. Senator Anderson noted that at Vogel Air Base in the Netherlands “a safety wire designed to keep the firing switch open had been accidentally pulled from a nuclear weapon and that device, if dropped, would have exploded.” See Anderson, *Outsider in the Senate*, p. 172. “Letter, From Harold M. Agnew,” p. 8; “Report on U.S. Policies Regarding Assignment of Nuclear Weapons to NATO,” p. 37.
- 303 (261) *A rocket-propelled version of the Mark 7 was unloaded, fully armed*: See “Incidents and Accidents,” Incident #3, p. 21.
- 304 (261) “*During initial inspection after receipt*”: See *ibid.*, Incident #1, p. 52.
- 304 (261) *A screwdriver was found inside one of the bombs; an Allen wrench was somehow left inside another*: See *ibid.*, Incident #1, p. 70.
- 304 (261) *the training and operating manuals for the Mark 7*: See “Letter, from Harold M. Agnew,” p. 2.
- 304 (261) “*In many areas we visited*”: “Report on U.S. Policies Regarding Assignment of Nuclear Weapons to NATO,” p. 38.

- 304 (262) *“far from remote”*: Ibid., p. 2.
- 305 (262) *a mishap on January 16, 1961*: See *ibid.* and “Incidents and Accidents,” Incident #3, p. 38. I was able to confirm where the accident occurred.
- 305 (262) *the current “fictional” custody arrangements*: “Report on U.S. Policies Regarding Assignment of Nuclear Weapons to NATO,” p. 39.
- 305 (262) *A lone American sentry ... was bound to start “goofing off”*: See *ibid.*, p. 32.
- 306 (263) *Agnew brought an early version of the electromechanical locking system*: Agnew interview.
- 306 (263) *The coded switch ... weighed about a pound*: A weapon often contained two of these switches as a redundancy, to ensure that at least one would work. See “Command and Control Systems for Nuclear Weapons,” p. 13.
- 306 (263) *the decoder weighed about forty*: Ibid., p. 14.
- 306 (264) *anywhere from thirty seconds to two and a half minutes to unlock*: Ibid., p. 13.
- 307 (264) *“No single device can be expected to increase”*: Quoted in “Subject: Atomic Stockpile, Letter, From John H. Pender, Legal Adviser, Department of State, To Abram J. Chayes, Legal Adviser, Department of State,” July 16, 1961 (top secret/declassified), NSA, p. 4.
- 307 (264) *“adequately safe, within the limits”*: Quoted in *ibid.*
- 307 (264) *“all is well with the atomic stockpile program”*: Ibid.
- 307 (265) *Wiesner was deeply concerned about the risk*: See Carl Kaysen, “Peace Became His Profession,” in Walter A. Rosenblith, ed., *Jerry Wiesner: Scientist, Statesman, Humanist* (Cambridge, MA: MIT Press, 2003), p. 102.
- 308 (265) *the locks might help “to buy time”*: The quote comes from “Memorandum for the President, From Jerome B. Wiesner, May 29, 1962,” in “PAL Control of Theater Nuclear Weapons,” p. 84.
- 308 (265) *“individual psychotics”*: Ibid.
- 308 (265) *prevent “unauthorized use by military forces”*: Ibid.
- 308 (265) *Known at first as “Prescribed Action Links”*: See Stein and Feaver, *Assuring Control of Nuclear Weapons*, pp. 36–37.
- 308 (265) *the broad outlines of his defense policies*: “The decisions of March 1961,” Desmond Ball has written, “determined to a very large extent the character of the U.S. strategic-force posture for the next decade.” The most important

- decisions had been made during the first two weeks of the month. See Ball, *Politics and Force Levels*, pp. 107–26. The quote is from page 121. 266 *five of them would inflict more damage*: The comparison was made between five 1-megaton weapons and one 10-megaton—with the larger number of small weapons achieving more blast damage. See Enthoven, *How Much Is Enough?*, pp. 179–84.
- 309 (266) *the Navy had requested a dozen Polaris subs*: See Ball, *Politics and Force Levels*, pp. 45–46.
- 309 (266) *Kennedy decided to build 41*: See *ibid.*, pp. 46–7, 116–17.
- 310 (267) *about half of SAC’s bomber crews, if not more*: Cited in “Statement of Robert S. McNamara on the RS-70,” Senate Armed Services Committee, March 14, 1962 (top secret/declassified), NSA, p. 12. This document somehow escaped the black pen of a Pentagon censor—it discloses the nuclear yield and accuracy of the major strategic weapon systems at the time. That information can be found on page 18.
- 310 (267) *“pipe-smoking, tree-full-of-owls type”*: I first encountered this quote in Fred Kaplan’s superb *Wizards of Armageddon: The Untold Story of the Small Group of Men Who Have Devised the Plans and Shaped the Policies on How to Use the Bomb* (Stanford: Stanford University Press, 1991), p. 255. It comes from an article by White about the whiz kids running the Pentagon, “Strategy and the Defense Intellectuals,” *Saturday Evening Post*, May 4, 1963.
- 310 (267) *the proportion of SAC bombers on ground alert ... on airborne alert*: Policies that Eisenhower had strongly resisted became routine early in the Kennedy administration. During the presidential campaign, Kennedy had promised that SAC would have a round-the-clock airborne alert. For the details of SAC’s new alert policies, see “History of Headquarters Strategic Air Command, 1961,” SAC Historical Study No. 89, Headquarters, Strategic Air Command, Offutt AFB, Nebraska, January 1962 (top secret/declassified), NSA, pp. 58–65. For Kennedy’s campaign promise, see Ball, *Politics and Force Levels*, p. 18.
- 311 (268) *“one defense policy, not three”*: Quoted in Jack Raymond, “M’Namara Scores Defense Discord,” *New York Times*, April 21, 1963. McNamara had made his opposition to interservice rivalry clear from the start.

- 311 (268) *the Army was now seeking thirty-two thousand nuclear weapons*: Cited in “Memorandum from Secretary Defense McNamara to the Chairman of the Joint Chiefs of Staff (Lemnitzer),” May 23, 1962 (top secret/declassified), *Foreign Relations of the United States, 1961–1963, Volume VIII, National Security Policy*, p. 297.
- 311 (268) *as urgently needed ... as intercontinental ballistic missiles*: See “History of the XW-51 Warhead,” SC-M-67-683, AEC Atomic Weapon Data, January 1968 (secret/restricted data/ declassified), p. 10.
- 312 (268) *“appear to be unreasonably high”*: The document that the Army submitted as a reply to McNamara’s questions has been heavily censored, and yet the justification for seeking so many nuclear weapons seems clear. The Army wanted to defeat the Soviets on the ground in Western Europe, using “quick kill, quick response weapons.” And the author of the report was aware that the request might seem unreasonable. The full quote reads: “At the first reading, the number of weapons suggested appear to be unreasonably high.” In any event, the Army’s arguments failed to be persuasive. See “Requirements for Tactical Nuclear Weapons,” Special Studies Group (JCS), Project 23, C 2379, October 1962 (top secret/restricted data/declassified), p. 55.
- 312 (268) *“if the enemy does”*: Taylor criticized the “emotional resistance in some quarters” to providing American troops in Europe with tens of thousands of small nuclear weapons. See “Memorandum from the President’s Military Representative (Taylor) to President Kennedy, May 25, 1962 (top secret/declassified), *Foreign Relations of the United States, 1961–1963, Volume VIII, National Security Policy*, pp. 299–300. The quote is on page 300.
- 312 (269) *Air Force Intelligence had warned*: According to the Air Force, the Soviet Union would have as many as 950 long-range missiles by mid-1964 and 1,200 by mid-1965. Instead, the Soviets never had more than 209 long-range missiles until the late 1960s. Cited in Raymond L. Garthoff, “Estimating Soviet Military Intentions and Capabilities,” in Gerald K. Haines and Robert E. Leggett, eds., *Watching the Bear: Essays on CIA’s Analysis of the Soviet Union* (Washington, D.C.: Central Intelligence Agency Center for the Study of Intelligence, 2003), p.141 312 (269) *only*

- four missiles that could reach the United States*: Cited in *ibid.*, 269 *the Soviet program had secretly endured a major setback*: A leading Soviet rocket designer wrote the most authoritative account of what came to be known as the “Nedelin Catastrophe.” See Boris Chertok, *Rockets and People, Volume II: Creating a Rocket Industry* (Washington, D.C.: NASA History Series, 2006), pp. 597–641.
- 313 (270) *Tass ... announced that Nedelin had been killed in a plane crash*: See Osgood Caruthers, “Chief of Rockets Killed in Soviet,” *New York Times*, October 26, 1960.
- 314 (270) “*it would be premature to reach a judgment*”: See “Transcript of the Kennedy News Conference on Foreign and Domestic Matters,” *New York Times*, February 9, 1961.
- 314 (270) *Eisenhower had thought that twenty to forty would be enough*: Cited in “The Ballistic Missile Decisions,” Robert L. Perry, The RAND Corporation, October 1967, p. 14.
- 314 (270) *Jerome Wiesner advised President Kennedy that roughly ten times that number*: Wiesner thought that about two hundred missiles would be enough. See Ball, *Politics and Force Levels*, p. 85.
- 314 (270) *General Power wanted ... ten thousand Minuteman missiles*: Cited in Herbert F. York, *Race to Oblivion: A Participant’s View of the Arms Race* (New York: Simon Schuster, 1970), p. 152.
- 314 (271) *it was “a round number”*: The adviser was Herbert F. York. Quoted in Herken, *Counsels of War*, p. 153.
- 314 (271) “*a matter of transcendent priority*”: “Memorandum for the Chairman, Joint Chiefs of Staff; Subject: Command and Control,” Robert S. McNamara, August 21, 1961 (top secret/declassified), NSA, p. 1.
- 315 (271) “*The chain of command from the President down*”: “Letter, From Secretary of Defense McNamara to President Kennedy,” February 20, 1961 (top secret/declassified), in *Foreign Relations of the United States, 1961–1963, Volume VIII, National Security Policy*, p. 39.
- 315 (271–72) “*classify the attack, as large or small*”: Wainstein, al., “Evolution of U.S. Strategic Command and Control,” p. 292.



- 316 (272) *“The first duty of the command and control system”*: Paul Baran, “On a Distributed Command and Control System Configuration,” U.S.A.F. Project RAND, RM-2632, Research Memorandum, December 31, 1960, p. 19.
- 318 (272) *Messages would be broken into smaller “blocks”*: See Paul Baran, “On Distributed Communications Networks,” The RAND Corporation, P-2626, September 1962.
- 318 (274) *a “logical, survivable node in the control structure”*: “Memorandum for the President, Subject: National Deep Underground Command Center as a Key FY 1965 Budget Consideration,” Robert S. McNamara, November 7, 1963 (top secret /declassified), NSA, p. 2,4.
- 318 (274) *“austere” version or one of “moderate size”*: Ibid., p. 3.
- 319 (274) *“withstand multiple direct hits of 200 to 300 MT*: Ibid., p. 1.
- 320 (275) *While heading a committee on the risk of war by accident*: Thomas Schelling described his concern about the lack of secure communications between the White House and the Kremlin, his role in creating the “hot line,” and his admiration for the novel *Red Alert* in an e-mail exchange with me.

## AM ABGRUND

- 320 (276) *“Mankind must put an end to war”*: “Text of President Kennedy’s Address to the United Nations General Assembly,” *New York Times*, September 26, 1961.
- 320 (276) *“Today, every inhabitant of this planet”*: Ibid.
- 320 (277) *“peace race”... “general and complete disarmament”*: Ibid.
- 321 (277) *“Such a plan would not bring a world free from conflict”*: Ibid.
- 321 (277) *“Together we shall save our planet”*: Ibid.
- 321 (277) *“If a general atomic war is inevitable”*: Quoted in “Memorandum of Conference with President Kennedy,” September. 20, 1961 (top secret/declassified), in *Foreign Relations of the United States, 1961-1963, Volume VIII, National Security Policy*, p. 130.
- 321 (277) *Kennedy had just received a memo ... summarizing how an American first strike*: See “Memorandum from the President’s Military Representative

- (Taylor) to President Kennedy,” September. 19, 1961 (top secret/declassified), in *ibid.*, pp. 126–29.
- 321 (277) “*There are risks as well as opportunities*”: *Ibid.*, p. 128.
- 322 (277) *once again, Berlin was at the center of the crisis*: For the events in Berlin during the Kennedy years, see McGeorge Bundy, *Danger and Survival: Choices About the Bomb in the First Fifty Years* (New York: Random House, 1988), pp. 358–90; Vladislav M. Zubok, “Khrushchev and the Berlin Crisis (1958–1962),” *Cold War International History Project—Working Paper Series*, Working Paper No. 6, Washington, D. C., May 1993; Trachtenberg, *Constructed Peace*, pp. 251–351; Aleksandr Fursenko and Timothy Naftali, *Khrushchev’s Cold War: The Inside Story of an American Adversary* (New York: W. W. Norton, 2006), pp. 338–408; and Frederick Kempe, *Berlin 1961: Kennedy, Khrushchev, and the Most Dangerous Place on Earth* (New York: G. P. Putnam’s Sons, 2011).
- 322 (278) “*It is up to the United States to decide*”: Quoted in Fursenko and Naftali, *Khrushchev’s Cold War*, p. 364.
- 322 (278) “*Then it will be a cold winter*”: Quoted in *ibid.*
- 323 (278) *the Joint Chiefs of Staff did not have a wide range of options*: The historian Marc Trachtenberg suggests that Eisenhower’s nuclear strategy may have been more “flexible” than was later claimed. But the pressure to launch a full-scale nuclear attack on the Soviet Union—once American and Soviet troops were fighting on a battlefield in Europe—would have been enormous. See Trachtenberg *Conflict & Strategy*, pp. 209–12.
- 323 (279) *It would be “explosive”*: Quoted in Trachtenberg, *Constructed Peace*, p. 289.
- 323 (279) “*This is the time to create strength*”: “Telegram from the Supreme Allied Commander, Europe (Norstad) to Secretary of Defense McNamara” April 25, 1961 (top secret/declassified), in United States Department of State, *Foreign Relations of the United States, 1961–1963, Volume XVI, Eastern Europe; Cyprus; Greece; Turkey* (Washington, D.C.: Government Printing Office, 1994), p. 699.
- 323 (279) “*If a crisis is provoked*”: Quoted in Kampe, *Berlin 1961*, p. 129.
- 323 (279) “*and we have given our word*”: “Text of Kennedy Appeal to Nation for Increases in Spending and Armed Forces,” *New York Times*, July 26, 1961.

- 323 (279) *“Tell Kennedy that if he starts a war”*: Quoted in Zubok, “Khrushchev and the Berlin Crisis,” p. 25.
- 324 (280) *“[T]he current strategic war plan”*: Quoted in Kaplan, *Wizards of Armageddon*, p. 297.
- 324 (280) *“spasm war” ... a “ridiculous and unworkable notion”*: “Memorandum of Conversation with Mr. Henry Rowen, Deputy Assistant Secretary of Defense for International Security Affairs,” May 25, 1961 (top secret/declassified), *Foreign Relations of the United States, 1961–1963, Volume VIII, National Security Policy*, p. 82.
- 325 (281) *“We should be prepared to initiate general war”*: “Memorandum for General Maxwell Taylor, Military Representative to the President, Subject: Strategic Air Planning and Berlin,” September 5, 1961 (top secret/declassified), NSA, p. 3.
- 325 (281) *more than half the people in the Soviet Union ... millions more in Eastern Europe and China*: See *ibid.*, “Annex B, SIOP-62 An Appreciation,” Table IX, p. 12.
- 325 (281) *it would “inevitably” tip off the Soviets*: “Strategic Air Planning and Berlin,” p. 3. 326 (281) *“no more than fifteen minutes”*: *Ibid.*, “Annex A, An Alternative to SIOP-62,” p. 3.
- 326 (281) *“we should be able to communicate two things”*: *Ibid.*, Annex A, p. 6.
- 326 (281) *“less than 1,000,000”*: *Ibid.*, Annex A, p. 3.
- 326 (282) *“The plan is designed for execution”*: General Lemnitzer made these comments during a meeting with President Kennedy on September 13, 1961. Although these remarks were not directed specifically at Kaysen’s proposal, Lemnitzer had been sent it the previous week and did not like it. The quote comes from “SIOP-62 Briefing,” p. 50.
- 327 (282) *“If you have to go, you want LeMay”*: Quoted in “Bomber on the Stump,” *Time*, October 18, 1968.
- 327 (282) *“some portion of the Soviet ... nuclear force”*: Quoted in Sagan “SIOP-62: The Nuclear War Plan Briefing,” p. 22.
- 327 (282) *about 16 long-range missiles, 150 long-range bombers, and 60 submarine-based missiles*: See Steven J. Zaloga, *The Kremlin’s Nuclear Sword: The Rise and Fall of Russia’s Strategic Nuclear Forces, 1945 – 2000* (Washington, D.C.: Smithsonian Institution Press, 2002), pp. 241–47.

- 327 (282) *“while small percentage wise”*: “Strategic Air Planning and Berlin, Annex A, An Alternative to SIOP-62,” p. 10.
- 327 (282) *“In thermonuclear warfare”*: Ibid.
- 327 (282) *kill as many as 100 million Americans*: Two months earlier, Kaysen had calculated how many American lives might be saved by a large-scale civil defense program. In the absence of bunkers and shelters, Kaysen found that the use of one hundred Soviet weapons against American cities would kill between 62 to 100 million people. The American population, at the time, was about 180 million. See “Carl Kaysen, Memorandum for Mr. Bundy, Subject: Berlin Crisis and Civil Defense,” July 7, 1961, NSA, Appendix, p. 3.
- 327 (283) *a “rotten tooth which must be pulled out”*: Khrushchev had made the comparison during his Vienna meeting with Kennedy in 1961. Quoted in “Memorandum of Conversation, Subject: Germany and Berlin; Possible Visit by Khrushchev,” October 18, U.S. Department of State, *Foreign Relations of the United States, 1961–1963, Volume XV, Berlin Crisis, 1962–1963* (Washington, D.C.: Government Printing Office, 1994), p. 372.
- 328 (283) *“It’s not a very nice solution”*: Quoted in Kempe, *Berlin 1961*, p. 379  
 328 (283) *“Berlin developments may confront us”*: Quoted in “Memorandum to General Lemnitzer, From Maxwell D. Taylor,” September 19, 1961 (top secret/declassified), NSA.
- 328 (284) *General Power expressed concern that Khrushchev was hiding*: See “Memorandum of Conference with President Kennedy,” September 20, 1961, p. 130.
- 328 (284) *Power advocated an attack with the full SIOP*: *ibid.*
- 328 (284) *“The Western Powers have calmly resolved”*: “Text of Kennedy’s Address to United Nations.”  
 328 (284) *“whenever we feel it necessary”*: Quoted in Alfred Goldberg, Steven L. Rearden, Doris M. Condit, *History of the Office of the Secretary of Defense: The McNamara Ascendancy, 1961–1965* (Washington, D.C.: Government Printing Office, 1984), p. 162.
- 329 (285) *“with such a strike, we could in some real sense be victorious”*: “Minutes of Oct. 10, 1961 Meeting,” October. 10, 1961 (top secret/declassified), in U.S. Department of State, *Foreign Relations of the United States, 1961–1963*,

- Volume XIV, Berlin Crisis, 1961–1962* (Washington, D.C.: Government Printing Office, 1993), p. 489.
- 330 (285) *A. Selective nuclear attacks*: “Letter from President Kennedy to the Supreme Commander, Allied Powers Europe (Norstad),” October 20, 1961 (top secret/declassified), in *ibid.*, p. 523.
- 330 (285) *American tanks were sent to Checkpoint Charlie*: For a feel of the military standoff between American and Soviet armored forces, see Sydney Gruson, “Soviet Advance: 33 Vehicles Are Mile from Crossing Point Used by Americans,” *New York Times*, October 27, 1961; Sydney Gruson, “U.S. Tanks Face Soviet’s at Berlin Crossing Point,” *New York Times*, October 28, 1961; and Sydney Gruson, “U.S. and Russians Pull Back Tanks from Berlin Line,” *New York Times*, October 29, 1961; and Kempe, *Berlin 1961*, pp. 455–81.
- 331 (286) *The mushroom cloud rose about forty miles*: For the story of the “King of All Bombs” by two of its designers, see Viktor Adamsky and Yuri Smirnov, “Moscow’s Biggest Bomb: The 50-Megaton Test of October 1961,” *Cold War International History Project Bulletin*, Fall 1994.
- 331 (286) *with enough force to be detected by weather stations in New Zealand*: See “Transit of Pressure Waves Through New Zealand from the Soviet 50 Megaton Bomb Explosion,” E. Farkas, New Zealand Meteorological Service, *Nature*, February 24, 1962, pp. 765–66.
- 331 (286) *“There was hardly a week”*: Bundy, *Danger and Survival*, p. 363.
- 331 (286) *just before dawn, SAC headquarters in Omaha lost contact*: Sensors for the Bomb Alarm System had been installed at Thule but were not yet operational. For details of the Black Forest incident, see “History of Headquarters Strategic Air Command, 1961,” pp. 27–29.
- 332 (287) *“any maniac at a US military base”*: Quoted in Jerry T. Baulch, “Faulty Alert Never Reached Top Command,” *Washington Post and Times Herald*, April 4, 1962.
- 332 (287) *“Highly dispersed nuclear weapons”*: McNamara’s Athens speech is an important document in the history of the Cold War. The speech was also given my favorite level of classification: cosmic top secret. The quote is from “Defense Policy: Statement Made on Saturday 5 May by Secretary McNamara at the NATO Ministerial Meeting in Athens,” North Atlantic

- Council, May 5, 1962, (cosmic top secret/nato restricted/declassified), NSA, p. 9.
- 332 (287) *“Our best hope lies in conducting”*: Ibid., p. 6.
- 333 (287–88) *McNamara’s remarks were partly aimed at the French*: By maintaining a nuclear force independent of NATO control, France gained an influence disproportionate to its size and power. No matter how hard the United States might try to fight a limited war and restrict its attacks to Soviet military forces, a French decision to use nuclear weapons against Soviet cities would inexorably lead to an all-out war. The French strategy was known as “Deterrence of the Strong by the Weak.” “They have understood that we now have the finger on the trigger,” Charles de Gaulle, the president of France, once said. “We are becoming as redoubtable as a man walking in an ammunition depot with a lighter... . Of course, if he lights up, he’ll be the first to blow. But he will also blow all those around.” The quote comes from Bruno Tertrais, “Destruction Assurée: The Origins and Development of French Nuclear Strategy, 1945–1981,” in *Getting Mad*, pp. 73–74.
- 333 (288) *“lead to the destruction of our hostages”*: “Statement at Athens,” p. 7.
- 333 (288) *“the catastrophe which we most urgently wish to avoid”*: Ibid.
- 333 (288) *“Not targeting cities—how aggressive!”*: Quoted in Fursenko and Naftali, *Khrushchev’s Cold War*, p. 442.
- 333 (288) *“To get the population used to the idea”*: Ibid.
- 334 (289) *If Khrushchev’s scheme worked*: Dozens of books have been written about the Cuban missile crisis. I found these to be the most interesting and compelling: Aleksandr Fursenko and Timothy Naftali, *One Hell of a Gamble*: *Khrushchev, Castro, and Kennedy, 1958–1964* (New York: W. W. Norton, 1997); Graham Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis* (New York: Longman, 1999); Ernest R. May and Philip D. Zelikow, *The Kennedy Tapes: Inside the White House During the Cuban Missile Crisis* (New York: W. W. Norton, 2002); Max Frankel, *High Noon in the Cold War: Kennedy, Khrushchev, and the Cold War* (New York: Ballantine Books, 2005); and Michael Dobbs, *One Minute to Midnight: Kennedy, Khrushchev, and Castro on the Brink of Nuclear War* (New York: Knopf, 2008). Fursenko and Naftali skillfully include material from the Soviet archives. Frankel covered the

crisis for the *New York Times* and brings a firsthand feel to the drama. Allison and Zelikow use the crisis as a means of understanding larger questions of leadership and government behavior. *The Kennedy Tapes*, although based on edited transcripts, allows many of the principal actors to speak for themselves. And Dobbs conveys the simple fact that this is an incredible story, with stakes that couldn't possibly be higher.

- 334 (289) *twenty-four medium-range ballistic missiles, sixteen intermediate-range ballistic missiles*: Cited in Fursenko and Naftali "One Hell of a Gamble," p. 188.
- 334 (289) *forty-two bombers ... and about 50,000 personnel*: Ibid.
- 334 (289) *triple the number of land-based Soviet missiles that could hit the United States*: The Soviet Union had about twenty long range missiles in 1962. Cited in Allison and Zelikow, *Essence of Decision*, p. 92.
- 334 (289) "We have no bases in Cuba": "Letter from Chairman Khrushchev to President Kennedy," April 22, 1961, in U.S. Department of State, *Foreign Relations of the United States, 1961–1963, Volume VI, Kennedy-Khrushchev Exchanges* (Washington, D.C.: Government Printing Office, 1996), p. 12.
- 334 (289) "Our nuclear weapons are so powerful": "Text of Soviet Statement Saying That Any U.S. Attack on Cuba Would Mean War," *New York Times*, September 12, 1962.
- 336 (290) *their strategic purpose seemed to be a decapitation attack*: Regardless of Khrushchev's actual motive for deploying the missiles, they had the capability to destroy American command-and-control centers with little warning. And that made their presence in Cuba all the more unacceptable for the Kennedy administration. See May, et al. "History of the Strategic Arms Competition," Part 2, pp. 663–68.
- 336 (290) "It doesn't make any difference if you get blown up": "Off the Record Meeting on Cuba," October 16, 1962, in U.S. Department of State, *Foreign Relations of the United States, 1961–1963, Volume XI, Cuban Missile Crisis and Aftermath* (Washington, D.C.: Government Printing Office, 1996), p. 61.
- 336 (291) "If we attack Cuba ... in any way": May and Zelikow, *Kennedy Tapes*, p. 111.

- 336 (291) *"We've got the Berlin problem staring us in the face"*: Ibid., p. 113.
- 336 (291) *"almost as bad as the appeasement at Munich"*: Ibid.
- 337 (291) *"LeMay: I think that a blockade"*: Ibid., p. 117.
- 337 (291) *"I just agree with you"*: Ibid., p. 122.
- 337 (292) *"eliminate this clandestine, reckless and provocative threat"*: "Text of Kennedy's Address on Moves to Meet the Soviet Build-Up in Cuba," *New York Times*, October 23, 1962.
- 337 (292) *"move the world back from the abyss"*: Ibid.
- 338 (292) *Nearly two hundred B-47 bombers left SAC bases*: Cited in "Strategic Air Command Operations in the Cuban Crisis of 1962," *Historical Study*, vol. 1, no. 90 (1963), (top secret/declassified), NSA, p. 49.
- 338 (292) *Every day about sixty-five of the bombers circled*: Cited in *ibid.*, p. 97. 292
- "I am addressing you for the purpose"*: Quoted in *ibid.*, p. vii.
- 339 (293) *The American custodians of the Jupiters were ordered*: "The Jupiters," according to the historian Philip Nash, "continued to represent one of the gravest command-and-control problems in the Western arsenal." McNamara was so concerned about unauthorized use of the missiles that he ordered they not be fired, even in response to a Soviet attack on Italy or Turkey. See Nash, *Other Missiles of October*, pp. 125–127.
- 339 (293) *"an act of aggression which pushes mankind"*: "Letter from Chairman Khrushchev to President Kennedy," October 24, 1962, in *Foreign Relations of the United States, 1961–1963, Volume VI, Kennedy-Khrushchev Exchanges*, p. 170.
- 339 (293) *"Your action desperate"*: Quoted in Al Seckel, "Russell and the Cuban Missile Crisis," *Russell: The Journal of Bertrand Russell Studies*, vol. 4, no. 2 (Winter 1984–1985), p. 255.
- 340 (294–95) *"As I left the White House ... on that beautiful fall evening"*: Robert S. McNamara, *Blundering into Disaster: Surviving the First Century of the Nuclear Age* (New York: Pantheon, 1987), p. 11.
- 341 (295) *almost one hundred tactical nuclear weapons on the island*: See Furseuka and Naftali, "One Hell of a Gamble," p. 188.
- 342 (296) *"Absolutely not ... the Soviet Government did raise the issue"*: Quoted in Nash, *Other Missiles of October*, p. 157.



- 342 (296) *In order to deflect attention from the charge*: Nash does a superb job of describing how the Kennedy administration covered up the truth and spread the fiction that no secret deal had been with Khrushchev. See Nash, *Other Missiles of October*, pp. 150–71.
- 342 (296) *“genuine peace” with the Soviets*: “Text of Kennedy Speech to Class at American U.,” *Washington Post and Times Herald*, June 11, 1963.
- 342 (296) *And a hot line was finally created*: For the history and workings of the hot line, see Desmond Ball, “Improving Communications Links Between Moscow and Washington,” *Journal of Peace Research*, vol. 8, no. 2 (1991), pp. 135–59; and Haraldur Þór Egilsson, “The Origins, Use and Development of Hot Line Diplomacy,” *Netherlands Institute of International Relations*, Issue 85 in Discussion Papers in Diplomacy, No. 85, March 2003.
- 343 (296) *“We at the embassy could only pray”*: Quoted in Egilsson, “Origins, Use and Development of Hot Line,” pp. 2–3.
- 343 (297) *2,088 airborne alert missions ... almost 50,000 hours of flying time*: Cited in “Strategic Air Command Operations in the Cuban Crisis,” p. 48.
- 343 (297) *The case was settled out of court*: For details of the legal battle between Peter George and the creators of *Fail-safe*, See Scherman, “Everybody Blows Up!” 344 (297) *“The whole point of the doomsday machine is lost”*: The full title of the film is *Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb*. The screenplay was written by Stanley Kubrick, Peter George, and Terry Southern. *Strangelove* was directed by Kubrick and released in 1964 by Columbia Pictures.
- 344 (298) *“The probability of a mechanical failure”*: Sidney Hook, *The Fail-Safe Fallacy* (New York: Stein and Day, 1963), p. 14.
- 344 (298) *“the Communist determination to dominate the world”*: The quote appears on the back cover of *The Fail-Safe Fallacy*.
- 344 (298) *“‘fail safe,’ not unsafe”*: Roswell L. Gilpatric, “‘Strangelove’? ‘Seven Days’? Not Likely,” *New York Times*, May 17, 1964. A similarly reassuring article had appeared the previous year in a Sunday magazine carried by the *Los Angeles Times* and dozens of other large newspapers. See Donald Robinson, “How Safe Is Fail Safe? Are We in Danger of an Accidental War?,” *This Week Magazine*, January 27, 1963.

- 345 (299) *“The very existence of the lock capability”*: “Cable, To General Curtis E. LeMay, From General Thomas S. Power” (secret/declassified), NSA, February 17, 1964.
- 346 (299) *John H. Rubel—who supervised strategic weapon research and development*: Rubel went to work at the Pentagon during the Eisenhower administration and remained there for the first few years of the Kennedy administration, eventually serving as assistant secretary of defense for research and engineering. He spoke to me at length about the trouble with the Minuteman launch procedures and his criticisms of the SIOP. For a man of ninety-three, his memory is astonishing. In a recent book—*Doomsday Delayed: USAF Strategic Weapons Doctrine and SIOP-62, 1959–1962, Two Cautionary Tales* (New York: Hamilton Books, 2008)—Rubel describes his first briefing on the SIOP. He calls the experience a “descent into the deep heart of darkness, a twilight underworld governed by disciplined, meticulous, and energetically mindless groupthink aimed at wiping out half of the people living on nearly one third of the earth’s surface.” That feeling never entirely left him. Rubel also discussed nuclear weapon issues in an oral history for the John F. Kennedy Library. The entire transcript has been classified, and I’ve requested it under the Freedom of Information Act.
- 347 (300) *“an accident for which a later apology”*: “The Development of the SM-80 Minuteman,” Robert F. Piper, DCAS Historical Office, Deputy Commander for Aerospace Systems, Air Force Systems Command, April 1962 (secret/restricted data/declassified), NSA, p. 68.
- 347 (300) *“completely safe”*: The quote comes from an Air Force historian’s summary of the Air Force position. See *ibid.*, p. 70.
- 347 (300) *an independent panel was appointed to investigate*: The panel was headed by James C. Fletcher, who later became the head of NASA. For the Fletcher committee’s work, see *ibid.*, p. 71, and Rubel, *Doomsday Delayed*, pp. 17–21.
- 347(300) *a series of minor power surges*: The Minuteman launch switches relied on notching motors that rotated a single notch when the proper electrical pulse was sent. The turning of the launch keys transmitted a series of specific pulses—and once they were received, the notching motors rotated the notches, completed a circuit, and launched all the missiles. But a series of

- small power surges could mimic those pulses and activate the motors. The motors might silently rotate, one notch at a time, over the course of days or even months, without the launch crews knowing. And then, when the final notch turned, fifty missiles would suddenly take off. Rubel interview.
- 347 (300) *“I was scared shitless”*: The engineer was Paul Baran, later one of the inventors of packet switching. Quoted in Stewart Brand, “Founding Father,” *Wired*, March 2001.
- 347 (300) *the redesign cost about \$840 million*: Cited in Ball, *Politics and Force Levels*, p. 194.
- 347 (300) *To err on the side of safety*: See Dobbs, *One Minute to Midnight*, pp. 276–79; and “Strategic Air Command Operations in the Cuban Crisis,” pp. 72–73.
- 348 (301) *“Mr. McNamara went on to describe the possibilities”*: “State-Defense Meeting on Group I, II, and IV Papers,” p. 12.
- 348 (301) *“to fire nuclear weapons”*: Ibid.
- 348 (301) *“whether or not it was Soviet launched”*: Ibid.
- 348 (301) *“every effort to contact the President must be made”*: The predelegation policy from the Eisenhower era was largely retained. See “Memorandum from the President’s Special Assistant for National Security Affairs (Bundy to President Johnson,” September 23, 1964 (Top Secret/declassified), in U.S. State Department, *Foreign Relations of the United States, 1964-1968, Volume X, National Security Policy* (Washington, D.C.: Government Printing Office, 2002), p. 158.
- 349 (302) *a strategy of “Assured Destruction”*: “Draft Memorandum from Secretary of Defense McNamara to President Johnson,” December 6, 1963 (top secret/declassified), in *Foreign Relations of the United States, 1961-1963, Volume VIII, National Security Policy*, p. 549.
- 349 (302) *“30% of their population, 50% of their industrial capacity, and 150 of their cities”*: Ibid.
- 349 (302) *the equivalent of 400 megatons*: See Enthoven, *How Much Is Enough*, pp. 207–10.
- 349 (302) *McNamara said, “Thank God”*: “Transcript, Interview with Robert McNamara, March 1986, Part 2 of 5,” WGBH Media Library and Archives.
- 349 (302) *The move would improve “crisis stability”*: Ibid.

- 350 (302) *The new SIOP divided the “optimum mix”*: For the details of SIOP-4, adopted by the Johnson administration in 1966 and still in effect when McNamara left office, see William Burr, “The Nixon Administration, the ‘Horror Strategy,’ and the Search for Limited Nuclear Options, 1969 – 1972,” *Journal of Cold War Studies*, vol. 7, no. 3 (2005), pp. 42–47.
- 350 (303) *The number of nuclear weapons in the American arsenal*: At the end of the Eisenhower administration, the United States had about 19,000 nuclear weapons. By 1967, the size of the arsenal had reached its peak: 31,255 weapons. When McNamara left office, the number had fallen slightly to 29,561. See “Declassification of Certain Characteristics of the United States Nuclear Weapon Stockpile,” U.S. Department of Energy, December 1993, and “Fact Sheet, Increasing Transparency in the U.S. Nuclear Stockpile,” U.S. Department of Defense, May 3, 2010.
- 350 (303) *the number of tactical weapons had more than doubled*: In 1960 the United States deployed about 3,000 tactical weapons in Western Europe; in 1968, about 7,000. See Robert S. Norris, William M. Arkin, and William Burr, “Where They Were,” *Bulletin of the Atomic Scientists*, November/December 1999, p. 29.
- 351 (304) *A centralized command-and-control system ... had proven disastrous*: The top-down management style that McNamara brought to the Vietnam War almost guaranteed an American defeat. “The men who designed the system and tried to run it were as bright a group of managers as has been produced by the defense establishment of any country at any time,” the military historian Martin van Creveld has noted, “yet their attempts to achieve cost-effectiveness led to one of the least costeffective wars known to history.” McNamara’s office determined not only the targets that would be attacked but also set the rules for when a mission would be canceled for bad weather and specified the training level that pilots had to meet. For Van Creveld, “To study command as it operated in Vietnam is, indeed, almost enough to make one despair of human reason.” See Martin van Creveld, *Command in War* (Cambridge, MA: Harvard University Press, 1985), pp. 232–60. The quotes can be found on page 260.
- 351 (304) *“I don’t object to its being called McNamara’s war”*: “‘McNamara’s War’ Tag OKd by Defense Chief,” *Los Angeles Times*, April 25, 1964.

- 352 (305) *support for equal rights, labor unions, birth control, and abortion:*  
Although in 1968 LeMay was considered an archconservative, today he'd be called an old-fashioned liberal. See Jerry M. Flint, "LeMay Supports Legal Abortions," *New York Times*, October 24, 1968; "Wallace Keeps Silent on LeMay Racial View," *Los Angeles Times*, October 24, 1968; and Jerry M. Flint, "LeMay Says He Believes in Equal Opportunity," *New York Times*, October 29, 1968.
- 353 (305) *"War is never cost-effective":* LeMay's feelings about limited warfare are worth quoting at length. "Let me now propose some basic doctrines about war," LeMay wrote. "First, war in any proportion, no matter how limited, is a very serious and dangerous business. War is *never* 'cost-effective' in terms of dollars and blood. People are killed. To them war is total. You cannot tell the bereaved wives, children, and parents that today's war in Vietnam, for example, is a counterinsurgency exercise into which the United States is putting only a limited effort. Death is final, and drafted boys should not be asked to make this ultimate sacrifice unless the Government is behind them 100 percent. If we pull our punches how can we explain it to their loved ones? Our objectives must be clearly enough defined to warrant the casualties we are taking." Curtis E. LeMay, *America Is in Danger* (New York: Funk & Wagnalls, 1968), p. 305.
- 353 (305) *"but when you get in it":* "Excerpts from Comments by Wallace and LeMay on the War and Segregation," *New York Times*, October 4, 1968.
- 353 (305) *"We seem to have a phobia":* Ibid.
- 353 (305) *jeered by protesters yelling, "Sieg heil":* Quoted in "LeMay, Supporter of Dissent, Seems Upset by Hecklers," *New York Times*, October 25, 1968.
- 353 (306) *the antiwar movement was "Communist-inspired":* Quoted in Jerry M. Flint, "LeMay Fearful Communists Threaten American Values," *New York Times*, October 31, 1968.

## ANORMALE BEDINGUNGEN

- 354 (307) *a B-52 took off from Mather Air Force Base*: For the Yuba City crash, see *Airmunitions Letter*, No. 136-11-56H, Headquarters, Ogden Air Material Area, April 19, 1961 (Secret/Restricted Data/ declassified), pp. 2–18; “Joint Nuclear Accident Coordinating Center Record of Events,” (For Official Use Only/declassified), n.d.; and Magglet and Oskins, *Broken Arrow*, pp. 173–93.
- 354 (307) “*continue mission as long as you can*”: Quoted in Magglet and Oskins *Broken Arrow*, p. 176.
- 355 (308) “*a weak point in the aircraft’s structure*”: The report also noted that the B-52 has “a skin-loaded structure that readily disintegrates upon impact.” See “Accident Environments,” T. D. Brumleve, J. T. Foley, W. F. Gordon, J. C. Miller, A. R. Nord, Sandia Corporation, Livermore Laboratory, SCL-DR-69-86, January 1970 (secret/restricted data/declassified), p. 58.
- 355 (308) *On Johnston Island in the central Pacific*: For the missile explosions that occurred during the test series known as Operation Dominic, see Hansen, *Swords of Armageddon, Volume IV*, pp. 382–445; “Operation Dominic I, 1962,” U.S. Atmospheric Nuclear Weapons Tests, Nuclear Test Personnel Review, Defense Nuclear Agency, February 1983; Reed and Stillman, *Nuclear Express*, pp. 136–137; and Magglet and Oskins, *Broken Arrow, Volume II*, pp. 96–98.
- 356 (309) *Two thirds of the Thor missiles used in the tests*: Four of the six missile tests ended prematurely. Project 8C in the Fish Bowl series of Dominic had been carefully planned to determine the effects of a nuclear detonation on a reentry vehicle’s heat shield and other components. “The experiment was not completed,” a report later said with disappointment, “because after approximately 1 minute of flight the missile blew up.” One of the two successful tests had unexpected results. During the Starfish Prime shot, a 1.4-megaton warhead was detonated at an altitude of about 250 miles. The electromagnetic pulse was much stronger than anticipated, damaging three satellites, disrupting radio communications across the Pacific, and causing streetlights to go out on the Hawaiian island of Oahu, about eight hundred miles away. See “Operation Dominic: Fish Bowl Series,” M. J. Rubenstein,

Project Officers Report—Project 8C, Reentry Vehicle Tests, Air Force Special Weapons Center, July 3, 1963 (secret/restricted data/declassified), p. 6; “United States High-Altitude Test Experiences: A Review Emphasizing the Impact on the Environment,” Herman Hoerlin, a LASL monograph, Los Alamos National Laboratory, October 1976; and “Did High-Altitude EMP Cause the Hawaiian Streetlight Incident?,” Charles Vittitoe, Electromagnetic Applications Division, Sandia National Laboratories, System Design and Assessment Notes, Note 31, June 1989.

- 356 (309) *three workers at an Atomic Energy Commission base*: For details of the Medina explosion, see “Run! Three Do; Injuries Are Minor,” *San Antonio Express*, November 14, 1963; ““Just Running,”: Panic in Streets for Few Moments,” *San Antonio Light*, November 14, 1963; “Tons of TNT Explode in Weapons Plant,” *Tipton [Indiana] Daily Tribune*, November 14, 1963; Hausan, *Swords of Armageddon, Volume VII*, p. 272; Magglet and Oskins, *Broken Arrow, Volume II*, pp. 98–100.
- 357 (310) *a B-52 encountered severe air turbulence*: For details of the Cumberland Broken Arrow, see *Airmunitions Letter*, No. 136-11-56N, Headquarters, Ogden Air Material Area, March 10, 1964 (secret/ restricted data /declassified), pp. 2–17; Dan Whetzel, “A Night to Remember,” *Mountain Discoveries* (Fall/Winter, 2007); Maggelet and Oskins, *Broken Arrow*, p. 198.
- 358 (310) *Another accident with a Mark 53 bomb*: For details of the Bunker Hill Broken Arrow, see “B-58 with Nuclear Device Aboard Burns; One Killed,” *Anderson [Indiana] Herald*, December 9, 1964; “Memorial Services Held at Air Base,” *Logansport [Indiana] Press*, December 10, 1964; “Saw Flash, Then Fire, Ordered Plane Abandoned, Pilot Recalls,” *Kokomo [Indiana] Morning Times*, December 11, 1964; “A Review of the US Nuclear Weapon Safety Program—1945 to 1986,” R. N. Brodie, Sandia National Laboratories, SAND86-2955, February 1987, (secret/restricted data/ declassified), p. 13; “Remedial Action and Final Radiological Status, 1964 B-58 Accident Site, Grissom Air Reserve Base, Bunker Hill, Indiana,” Steven E. Rademacher, Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis, December 2000; and Maggelet and Oskins, *Broken Arrow*, pp. 204–10. After an accident that exposed five

- hydrogen bombs to burning jet fuel, the Air Force told the *Kokomo Morning Times* that there had been “no danger” of a radiation hazard.
- 358 (311) *a Minuteman missile site at Ellsworth Air Force Base*: See “Accidents and Incidents,” Incident #2, p. 182; and “Review of the US Nuclear Weapon Safety Program,” p. 14. The most detailed account can be found in Maggelet and Oskins, *Broken Arrow, Volume II*, pp. 101–9.
- 359 (312) *a group of sailors were pushing an A-4E Skyhawk*: The story of this long-hidden accident has been told in detail by Jim Little, a retired chief warrant officer with a long career managing nuclear weapons for the U.S. Navy. Little watched the plane roll off the deck of the *Ticonderoga*. His account of the accident can be found in Maggelet and Oskins, *Broken Arrow, Volume II*, pp. 113–16, and in his book, *Brotherhood of Doom: Memoirs of a Navy Nuclear Weaponsman* (Bradenton, FL: Booklocker, 2008.), pp. 113 – 14.
- 359 (312) “*Brakes, brakes*”: Quoted in Little, *Brotherhood of Doom*, p. 114.
- 360 (312) *recently graduated from Ohio State University*: Webster had flown seventeen combat missions in Vietnam and gotten married the previous year. One of his close friends from high school, Roger Ailes, later the president of Fox News, created a scholarship fund in Webster’s name. See William K. Alcorn, “Webster Scholarship to Help City Youths,” *Youngstown [Ohio] Vindicator*, July 3, 2006.
- 360 (313) “*responsibility for identifying and resolving*”: President Kennedy also asked to be kept informed about “the progress being made in equipping all Mark 7 nuclear weapons assigned to ground alert aircraft with velocity sensing safety devices.” He returned to the broader issue just nine days before his assassination, issuing a directive that safety rules be adopted for each weapon in the stockpile. Those rules would have to be approved by the secretary of defense—and shared, in writing, with the president of the United States. See “National Security Action Memorandum No. 51, Safety of Nuclear Weapons and Weapons Systems,” May 8, 1962 (secret/restricted data/declassified), NSA; and “National Security Memorandum No. 272, Safety Rules for Nuclear Weapon Systems,” November 13, 1963 (secret/restricted data/declassified).
- 360 (313) *the Titanic Effect*: Donald MacKenzie mentions the “Titanic effect” in the context of software design. “The safer a system is believed to be,” he



suggests, “the more catastrophic the accidents to which it is subject.” And as a corollary to that sort of thinking, MacKenzie argues that systems only become safer when their danger is always kept in mind. See MacKenzie’s essay “Computer- Related Accidental Death,” in *Knowing Machines*, pp. 185–213. The Titanic effect is discussed from pages 211 to 213.

361 (313) *an engineer listened carefully to the sounds of a PAL*: The Sandia engineer’s name was John Kane, and in this case his lock-picking skills exceeded those of technicians at the National Security Agency. See Stevens, “Origins and Evolution of S2C,” p. 71.

361 (313) *The W-47 warhead had a far more serious problem*: I learned about the unreliability of the W-47 warhead during my interviews with Bob Peurifoy and Bill Stevens. Some of the details can be found in Hansen *Swords of Armageddon, Volume VI*, pp. 433–41. Hansen called the W-47, without its safing tape, “an explosion in search of an accident.” Sybil Francis touched on the subject briefly in “Warhead Politics: Livermore and the Competitive System of Nuclear Weapons Design,” thesis (Ph.D.), Massachusetts Institute of Technology, Department of Political Science, 1995, pp. 152–53.

362 (314) *“almost zero confidence that the warhead would work”*: Quoted in Francis, “Warhead Politics,” p. 153.

362 (314) *perhaps 75 percent or more*: Cited in Hanson, *Swords of Armageddon, Volume VI*, p. 435.

362 (315) *a B-52 on a Chrome Dome mission*: The Palomares accident was the most widely publicized Broken Arrow of the Cold War. In addition to weeks of coverage in newspapers and magazines, the event inspired a fine book by Flora Lewis, a well-known foreign correspondent, *One of Our H-Bombs Is Missing* (New York: McGraw-Hill, 1967). Randall C. Maydew, one of the Sandia engineers who helped to find the weapon, later wrote about the search in *America’s lost H-Bomb! Palomares, Spain, 1966* (Manhattan, KS: Sunflower University Press 1977). Barbara Moran made good use of documents obtained through the Freedom of Information Act in writing *The Day We Lost the H-Bomb: Cold War, Hot Nukes, and the Worst Nuclear Weapons Disaster in History* (New York: Ballantine Books, 2009). I relied on those works, as well as on a thorough description of the accident’s aftermath—“Palomares Summary Report,” Field Command, Defense

- Nuclear Agency, Kirtland Air Force Base, January 15, 1975—and other published sources.
- 364 (316) *so poor and remote that it didn't appear on most maps*: See “Palomares Summary Report,” p. 18 365 (317) “450 airmen with Geiger counters”: Quoted in *ibid.*, p. 184.
- 365 (317) “unarmed nuclear armament” ... “there is no danger to public health”: Quoted in *ibid.*, p. 185.
- 365 (317) “secrecy shrouds urgent hunt”: Quoted in *ibid.*, p. 203.
- 365 (317) “madrid police disperse mob at u.s. embassy”: Quoted in *ibid.*
- 365 (317) “near catastrophe from u.s. bomb”: Quoted in *ibid.*
- 365 (317) “There is not the slightest risk”: Quoted in “The Nuke Fluke,” *Time*, March 11, 1966.
- 366 (318) “the politics of the situation”: “Palomares Summary Report,” p. 50.
- 366 (318) *Almost four thousand truckloads of contaminated beans*: Cited in *ibid.*, p. 56.
- 366 (318) *About thirty thousand cubic feet of contaminated soil*: According to the Defense Nuclear Agency, about 1,088 cubic yards were removed—roughly 29,376 cubic feet. Cited in *ibid.*, p. 65.
- 366 (318) “a psychological barrier to plutonium inhalation”: *Ibid.*, footnote, p. 51.
- 366 (318) *the American ambassador brought his family*: For this and other efforts to control public opinion, see David Stiles, “A Fusion Bomb over Andalucía: U.S. Information Policy and the 1966 Palomares Incident,” *Journal of Cold War Studies*, vol. 8, no. 1 (2006), pp. 49–67.
- 367 (319) *who claimed to have seen a “stout man”*: “How They Found the Bomb,” *Time*, May 13, 1966.
- 367 (319) “It isn't like looking for a needle”: Quoted in Lewis, *One of Our H-Bombs Is Missing*, p. 182.
- 367 (319) *the first time the American people were allowed to see one*: For the proud display, see *ibid.*, p. 234; Stiles, “Fusion Bomb over Andalucía,” p. 64. 320 “The possibility of an accidental nuclear explosion”: Quoted in Hanson W. Baldwin, “Chances of Nuclear Mishap Viewed as Infinitesimal,” *New York Times*, March 27, 1966.
- 368 (320) “so remote that they can be ruled out completely”: Quoted in *ibid.*

- 368 (320) *“But suppose some important aspect of nuclear safety”*: “The Nuclear Safety Problem,” T. D. Brumleve, Advanced System Research Department 5510, Sandia Corporation, Livermore Laboratory, SCL-DR-67, 1967 (secret/restricted data/declassified), p. 5.
- 369 (320) *“The nation, and indeed the world, will want to know”*: Ibid., p. 5.
- 369 (320) *a B-52 was serving as the Thule monitor*: The Broken Arrow at Thule has received much less attention in the United States than the one at Palomares. But the Thule accident remains of interest in Denmark because the crash not only contaminated Danish soil with plutonium but also raised questions about the behavior of the Danish government. I found two declassified documents to be especially interesting. The first is “Project Crested Ice: The Thule Nuclear Accident,” Vol. 1, SAC Historical Study #113, History and Research Division, Headquarters, Strategic Air Command, April 23, 1969 (secret/restricted data/declassified), NSA. The other is “Project Crested Ice,” a special edition of *USAF Nuclear Safety* magazine that appeared in 1970. The latter has many photographs that show the challenge of decontaminating a large area in the Arctic. A number of recent investigations by Danish authors were also useful: “The Marshal’s Baton: There Is No Bomb, There Was No Bomb, They Were Not Looking for a Bomb,” Svend Aage Christensen, Danish Institute for International Studies, DIIS Report, 2009, No. 18., 2009; and Thorsten Borring Olesen, “Tango for Thule: The Dilemmas and Limits of the ‘Neither Confirm Nor Deny’ Doctrine in Danish-American Relations, 1957–1968,” *Journal of Cold War Studies*, vol. 13, no. 2 (Spring 2011), pp. 116–47. And I learned much from the documents in Maggelet and Oskins, *Broken Arrow, Volume II*, pp. 125–50.
- 369 (320) *three cloth-covered, foam-rubber cushions*: For details of the accident and the rescue, see “Crested Ice: The Thule Nuclear Accident,” pp. 5–8; “The Flight of Hobo 28,” in *USAF NUCLEAR SAFETY*, special edition, vol. 65 (part 2), no. 1 (JAN/FEB/MAR 1970), pp. 2–4; and Neil Sheehan, “Pilot Says Fire Forced Crew to Quit B-52 in Arctic,” *New York Times*, January 28, 1968; and Alfred D’Amario, *Hangar Flying* (Bloomington, IN: AuthorHouse, 2008), pp. 233–54. D’Amario served as a co-pilot on the

- flight, and he vividly describes what it was like to bail out of a burning B-52 over the Arctic.
- 369 (321) *about 428 degrees Fahrenheit*: Cited in “Crested Ice: The Thule Nuclear Accident,” p. 7.
- 369 (321) *temperature ... was -23 degrees Fahrenheit*: Cited in G. S. Dresser, “Host Base Support,” in *USAF Nuclear Safety*, p. 25.
- 369 (321) *windchill made it feel like -44*: The wind was blowing at 9 knots (10.3 miles per hour); the temperature was –23 degrees Fahrenheit; and according to a windchill chart compiled by the National Weather Service, that means the windchill was roughly –44 degrees Fahrenheit. See “Host Base Support,” p. 25.
- 370 (321) *SAC headquarters was notified, for the first time, about the fire*: Ibid., p. 25.
- 371 (322) *uncovered skin could become frostbitten within two*: Ibid.
- 371 (322) *But he later worked as a postmaster in Maine*: See Keith Edwards, “Sons Recall Father’s Story of Survival in Greenland after SAC Bomber Crash,” *Kennebec Journal*, March 17, 2010.
- 371 (323) *The radioactive waste from Thule filled 147 freight cars*: Cited in Leonard J. Otten, “Removal of Debris from Thule,” in *USAF Nuclear Safety*, p. 90.
- 373 (324) *claims that an entire hydrogen bomb had been lost*: Those claims are convincingly refuted by “The Marshal’s Baton. There Is No Bomb, There was No Bomb, They were Not Looking for a Bomb.” 373 (324) *The B-52 ... had been on a “training flight”*: Quoted in Thomas O’Toole, “4 H-Bombs Lost as B-52 Crashes,” *Washington Post and Times Herald*, January 23, 1968.
- 373 (324) *A handful of people within the Danish government*: See “Tango for Thule,” pp. 123–31.
- 373 (324) *stored in secret underground bunkers at Thule as early as 1955*: In a recent article for the base newsletter—the *Thule Times*, published by the Air Force Space Command—a retired lieutenant colonel, Ted A. Morris, described a trip to Greenland in May 1955. Morris and his crew flew there in a B-36 bomber, landed, and practiced the loading of a “live war reserve Mk 17” hydrogen bomb that had been stored at the base. The practice of flying to Thule without nuclear weapons and picking them up there seems to have been routine. “How about all those underground ammo bunkers?,” Adams

- wrote. “Maybe you thought they were there for the Greenlanders to use instead of igloos.” See Ted A. Adams, “Strategic Air Command at the Top of the World,” *Thule Times*, November 1, 2001. 324 *antiaircraft missiles with atomic warheads were later placed at Thule*: See Norris, Arkin, and Burr, “Where They Were,” p. 32.
- 375 (325) *Walske, was concerned about the risks of nuclear accidents*: Bill Stevens spoke to me about Walske’s interest in weapon safety. At the time, Walske also served as the head of the Military Liaison Committee to the Atomic Energy Commission. See Stevens, “Origins and Evolution of S2C,” p. 85.
- 375 (325) *range from one in a million to one in twenty thousand*: Stevens interview.
- 375 (325) *“probability of a premature nuclear detonation”*: See “Standards for Warhead and Bomb Premature Probability MC Paragraphs,” in Appendix G, *Ibid.*, p. 216.
- 375 (325) *“normal storage and operational environments”*: *Ibid.*
- 375 (326) *“the adoption of the attached standards”*: “Letter, To Brigadier Military Applications, U.S. Atomic Energy Commission, From Carl Walske, Chairman of the Military Liaison Committee to the U.S. Atomic Energy Commission, 14 March 1968,” in Appendix G, *ibid.*, p. 215.
- 375 (326) *the test of an atomic cannon*: The weapon, nicknamed “Atomic Annie,” was fired as the Grable shot in the UPGHOT-KNOTHOLE nuclear tests during the spring of 1953.
- 375 (326) *trucks, tanks, railroad cars*: For the animals and inanimate objects subjected to the detonation of the Grable atomic artillery shell, see “Shots Encore to Climax: The Final Four Tests of the UPGHOT-KNOTHOLE Series, 8 May–4 June 1953,” United States Atmospheric Nuclear Weapons Tests, Nuclear Test Personnel Review, Defense Nuclear Agency, DNA 6018F, January 15, 1982, pp. 127–58; and “Military and Civil Defense Nuclear Weapons Effects Projects Conducted at the Nevada Test Site: 1951–1958,” Barbara Killian, Technical Report, Defense Threat Reduction Agency, May 2011. Details of the Grable shot are mentioned throughout the latter report.
- 375 (326) *more than three thousand soldiers, including Bill Stevens*: For the people involved in the test, see “Shots Encore to Climax,” pp. 120–27.
- 376 (327) *The official list of nuclear accidents*: The Pentagon’s “official” list of Broken Arrows now mentions thirty-two accidents, from 1950 until 1980.

According to the Department of Defense, an “accident involving nuclear weapons” is “an unexpected event” that results in any of the following: “Accidental or unauthorized launching, firing, or use ... of a nuclear-capable weapon system” that could lead to the outbreak of war; a nuclear detonation; “non-nuclear detonation or burning of a nuclear weapon or radioactive weapon component”; radioactive contamination; “seizure, theft, or loss of a nuclear weapon,” including the jettison of a bomb; “public hazard, actual, or implied.” But at least one third of the accidents on the Pentagon’s list involved nuclear weapons that were not fully assembled and could not produce a nuclear yield. Far more dangerous, yet less dramatic, accidents—like the unloading of Mark 7 bombs fully armed—have been omitted from the list. Countless mundane accidents posed a grave risk to the public, both actual and implied. For the official list, see “Narrative Summaries of Accidents Involving U.S. Nuclear Weapons, 1950–1980,” U.S. Department of Defense, (n.d.).

- 377 (327) *at least 1,200 nuclear weapons had been involved*: Bill Stevens likes to err on the conservative side, relying on the Pentagon’s definition of an “accident.” One Sandia weapon report used the term more broadly, including events “which may have safety significance.” For the number of these events, see Brumleve, “Accident Environments,” p. 154.
- 377 (328) *“During loading of a Mk 25 Mod O WR Warhead”*: “Accidents and Incidents,” Incident #8, p. 29.
- 377 (328) *“A C-124 Aircraft carrying eight Mk 28 War reserve Warheads”*: Ibid., Incident #17, p. 63.
- 377 (328) *Twenty-three weapons had been directly exposed to fires*: Cited in Brumleve “Accident Environments,” p. 69.
- 378 (328) *blinding white flash*: At Sandia the acronym BWF was used as a shorthand for that phrase, and it was something nobody there cared to see.
- 378 (328) *he’d watched a bent pin nearly detonate an atomic bomb*: Stan Spray was not the source of this information.
- 379 (329) *The Navy tested many of its weapons*: Sandia thought that these “Admiral’s Tests” were unnecessary; when electromagnetic radiation triggered the rocket motors of a missile aboard an aircraft carrier, the lab took a different view. See Stevens, “Origins and Evolution of S2C,” pp. 58–60.

- 379 (329) *Lightning had struck a fence at a Mace medium-range missile complex*: See “Accidents and Incidents,” Incident #2, p. 122.
- 379 (329) *Four Jupiter missiles in Italy had also been hit by lightning*: See *ibid*, Accident #2, pp.51–52; Incident #39, p.69; and Incident #41, pp.86–87. 330  
*Stan Spray’s group ruthlessly burned, scorched, baked*: My account of the Nuclear Safety Department’s work is based on interviews with Stevens, Peurifoy, and other Sandia engineers familiar with its investigations. Spray has contributed to a couple of papers about the safety issues that were explored: “The Unique Signal Concept for Detonation Safety in Nuclear Weapons, UC-706,” Stanley D. Spray, J. A. Cooper, System Studies Department, Sandia National Laboratories, SAND91-1269, 1993; and “History of U.S. Nuclear Weapon Safety Assessment: The Early Years,” Stanley D. Spray, Systems Studies Department, Sandia National Laboratories, SAND96- 1099C, Version E, May 5, 1996.
- 381 (331) *a “supersafe bomb”*: See “Project Crescent: A Study of Salient Features for an Airborne Alert (Supersafe) Bomb,” Final Report, D. E. McGovern, Exploratory Systems Department I, Sandia Laboratories, SC-WD-70-879, April 1971 (secret/restricted data/declassified).
- 381 (331) *“under any conceivable set of accident conditions”*: “Project Crescent,” p. 7.
- 381 (331) *mistakenly dropped from an altitude of forty thousand feet*: Peurifoy interview.
- 381 (331) *“less than enthusiastic about requiring more safety”*: See “Memo, Conceptual Study of Super-Safety,” Colonel Richard H. Parker, United States Air Force, Assistant Director for Research and Development, Division of Military Application, May 14, 1968, in “Project Crescent,” p. 101.
- 382 (332) *“We are living on borrowed time”*: Peurifoy interview.
- 384 (333) *Peurifoy and Fowler went to Washington*: See Stevens, “Origins and Evolution of S2C,” pp. 115–16.
- 385 (333) *The “Fowler Letter”*: “To Major General Ernest Graves, Assistant General Manager for Military Application, Division of Military Application, U.S. Atomic Energy Commission, From G. A. Fowler, Vice President, Systems,

Sandia Laboratories, Subject: Safety of Aircraft Delivered Nuclear Weapons Now in Stockpile,” November 15, 1974 (secret/restricted data/declassified).

## FÜNFTER TEIL: DAMASCUS

### AUSGEWOGEN UND UNAUSGEWOGEN

- 388 (337) *James L. “Skip” Rutherford III was working:* Interview with Skip Rutherford.
- 388 (337) *“It’s about the Titan missiles”:* Ibid.
- 389 (338) *The missiles were old, the airmen said:* I spoke to one of the airmen, who preferred to remain anonymous, and he confirmed Rutherford’s account.
- 389 (338) *Pryor was disturbed by the information:* Interview with David H. Pryor.
- 389 (338) *other members of Congress were concerned:* Dan Glickman spoke to me about his efforts to retire the Titan II. I’m glad that he saved a copy of the Damascus accident report and donated it to Wichita State University, along with his other congressional papers.
- 389 (338) *At Launch Complex 533-7, about an hour southeast of Wichita:* My description of the accident in Rock, Kansas, is based principally on “Report of Missile Accident Investigation: Major Missile Accident, Titan II Complex 533-7, Assigned to 381st Strategic Missile Wing, McConnell Air Force Base, Kansas,” conducted at McConnell Air Force Base, Kansas, September 22–October 10, 1978. Albert A. Kamas, a Wichita attorney who represented a number of people hurt in the accident, not only shared his memory of the event but also sent me documents, newspaper clippings, and videotaped local news accounts of it. Julie Charlip, who covered the story for the *Wichita Eagle*, graciously shared a print reporting on it. And Colonel Ben G. Scallorn, who headed the accident investigation, discussed its findings with me.
- 390 (339) *Malinge had never been inside a Titan II silo before:* See David Goodwin, “Victim of AF Missile Accident Wanted Only to Be a Mechanic,” *Wichita Eagle* January 18, 1979.



- 391 (339) *“Oh my God, the poppet”*: “Major Missile Accident, Titan II Complex 533-7,” Affidavit of Charles B. Frost, Second Lieutenant, Tab U-4, page 3.
- 391 (340) *“What was the poppet”*: Ibid.
- 391 (340) *“Get out of here, let’s get out”*: Quoted in *ibid.*
- 391 (340) *“Where are you?”*: Ibid. 340 *“Come back to the control center”*: Ibid.
- 391 (340) *“I can’t see”*: Quoted in *ibid.*, Affidavit of Richard I. Bacon, Jr., Second Lieutenant, Tab U-7.
- 392 (340) *“Hey, I smell Clorox”*: Quoted in *ibid.*, Frost affidavit, Tab U-4, p. 3.
- 392 (341) *quickly registered one to three parts per million*: Cited in *ibid.*, p. 5.
- 393 (342) *“My God, help us, help us, we need help”*: Quoted in *ibid.*, p. 4.
- 393 (342) *“Hey, door eight is locked”*: Ibid.
- 393 (342) *“Hey, you guys, get out of here”*: Ibid., p. 5.
- 393 (342) *“Come help me”*: Quoted in *ibid.*
- 393 (342–43) *“This is three-seven ... . The locks are on the safe”*: Ibid.
- 394 (343) *“Where’s the dep, where’s the dep?”*: Quoted in *ibid.*
- 394 (343) *“We’ll get him later”*: Ibid.
- 394 (343) *“My God, please help me”*: Quoted in *ibid.*, Affidavit of Keith E. Matthews, First Lieutenant, Tab U-3, p. 4.
- 395 (344) *“Get them under the fire hydrant”*: Ibid., p. 5.
- 396 (344) *Jackson ... climbed the ladder all the way to the bottom in his RFHCO*: It was clearly possible to wear a RFHCO and enter the escape hatch. “Airman Jackson changed helmets,” the report said, “and went to the bottom of the air intake shaft (escape hatch) but could not find the entry to the control center.” Jackson had never been in it before and climbed down until reaching a pool of water at the very bottom. The darkness and the cloud of oxidizer—not the size of the shaft or the escape hatch—prevented him from getting into the control center. The quote is from page 8 of the report. See also the affidavit of John C. Mock, Jr., technical sergeant, Tab U-25, pp. 1–2. Mock was a PTS team chief and supervisor, but he’d never gone down the escape hatch, either.
- 396 (345) *Someone hadn’t put a filter inside the oxidizer line*: See “Major Missile Accident, Titan II Complex 533-7,” p. 10.
- 396 (345) *someone may have deliberately omitted the filter*: According to Jeff Kennedy, oxidizer would flow more quickly without the filter, and the job

could be completed in less time. Some PTS crews were willing to break the rules. But if you wanted to cut corners and not get caught, you also had to remove the O-ring. Otherwise it might clog the line and cause a leak—like it did during the Rock, Kansas, accident. Kennedy interview. See also Julie Charlip, “Missile Workers a Special Breed,” *Wichita Eagle-Beacon*. May 31, 1981.

- 397 (346) *The Air Force recommended ... that black vinyl electrical tape be used:* After the accident, the Air Force assembled a team of experts from Boeing, NASA, Martin-Marietta, and other aerospace groups to examine the RFHCOs involved in the Rock, Kansas, accident. They found, among other things, that the suits were vulnerable to leakage at the “glove-cuff interface,” especially when a forceful spray of liquid was applied there. Sealing the interface with vinyl electrical tape, the group decided, would be a possible, “very short term solution.” See “Class A Ground Launch Missile Mishap Progress Report No. 61,” Eighth Air Force Accident Investigation Board, McConnell Air Force Base, September 24, 1978; and Julie Charlip, “Missile Suit Flawed, Says AF Report,” *Wichita Eagle* February 20, 1979.
- 397 (346) *Carl Malinger had a stroke, went into a coma:* See Goodwin, “Victim of AF Missile Accident.” 397 (346) *his mother later felt enormous anger at the Air Force:* Ibid.
- 397 (346) *failed to “comply with [Technical Order] 21M-LGM25C-2-12”:* “Major Missile Accident, Titan II Complex 533-7,” p. 11.
- 397 (346) *“To err is human, ... to forgive is not SAC policy”:* Quoted in Moody, *Building a Strategic Air Force*, p. 469.
- 398 (346) *Its warhead was more than seven times more powerful:* The single W-56 warhead on the Minuteman II had a yield of about 1.2 megatons. The W-62 warheads carried by Minuteman III missiles at the time had a yield of about 170 kilotons. Each Minuteman III had three of them, for a combined yield of slightly more than half a megaton. The 9-megaton warhead atop the Titan II was far more powerful.
- 398 (346–47) *the fifty-four Titan IIs represented roughly one third of their total explosive force:* Cited in Walter Pincus, “Aging Titan II Was Time Bomb Ready to Go Off,” *Washington Post*, September 20, 1980.

- 398 (347) *one of Rutherford's confidential sources later told him*: Rutherford interview. See also Pincus, "Aging Titan II Was Time Bomb."
- 398 (347) *a siren "might cause people to leave areas of safety"*: "Letter, From Colonel Richard D. Osborn, Chief Systems Liaison Division, Office of Legislative Liaison, To Senator David Pryor," November 7, 1979, David H. Pryor Papers, University of Arkansas, Fayetteville.
- 399 (347) *Colonel Richard D. Osborn told Pryor*: Ibid. The sirens could prove especially dangerous, Osborn argued, "during periods of darkness."
- 399 (347) *one half to two thirds of the Air Force's F-15 fighters were grounded*: The Tactical Air Command considered a plane "fully mission capable" if it could be flown with one day of preparation. In 1978 about 35 percent of TAC's F-15 fighters were fully mission capable; the proportion was about 56 percent in 1980. Cited in Marshall L. Michel III, "The Revolt of the Majors: How the Air Force Changed After Vietnam," dissertation submitted to Auburn University, Auburn, Alabama, December 15, 2006, pp. 290–91.
- 399 (347) *The Strategic Air Command had lost more than half of its personnel*: In 1961, SAC had 280,582 personnel; by 1978, it had 123,042. The 1961 figure is cited in Polmar, *Strategic Air Command*, p. 72. The 1977 figure comes from Alwyn Lloyd, *A Cold War Legacy, 1946–1992: A Tribute to Strategic Air Command* (Missoula, MT: Pictorial Histories Publishing Co., 1999), p. 516.
- 399 (347) *"bomber generals" who'd risen through the ranks at SAC*: For the cultural battle within the Air Force, see Mike Worden, *Rise of the Fighter Generals: The Problem of Air Force Leadership, 1945–1982* (Maxwell Air Force Base, AL: Air University Press, 1998).
- 399 (348) *the inflexible, "parent-child relationship"*: Tom Clancy and Chuck Horner, *Every Man a Tiger* (New York: G. P. Putnam's Sons, 1999), p. 96.
- 399 (348) *"I didn't hate them because they were dumb"*: Ibid., p. 86.
- 399 (348) *"never again be a part of something so insane and foolish"*: Ibid., p. 96.
- 400 (348) *illegal drug use soared*: Decades later, it seems hard to believe how widely the drug culture had spread throughout the American military. Between 1976 and 1981, the Department of Defense rarely performed mandatory drug tests. As a result, a great many servicemen were often high while in uniform. And their access to military equipment provided some unusual

opportunities. Operating out of Travis, Langley, and Seymour Johnson air bases, active and retired military personnel imported perhaps \$100 million worth of pure heroin into the United States during the mid-1970s. When their drug operation was broken up in 1976, a DEA agent called it “one of the largest heroin smuggling operations in the world.” See “U.S. Breaks \$100 Million Heroin Ring; Charges GI Group Used Air Bases, Crew,” *Los Angeles Times*, March 26, 1976.

- 400 (348) *about 27 percent of all military personnel were using illegal drugs:* Cited in Marvin R. Burt, “Prevalence and Consequences of Drug Abuse Among U.S. Military Personnel: 1980,” *American Journal of Drug and Alcohol Abuse*, vol. 8, no. 4 (1981–2), p. 425.
- 400 (349) *the Marines had the highest rate of drug use:* Almost half of the young enlisted personnel in the Marines had smoked pot in the previous month. See *ibid.*, p. 428.
- 400 (349) *About 32 percent of Navy personnel used marijuana:* Cited in *ibid.*, p. 425.
- 400 (349) *the proportion of Army personnel was about 28 percent:* Cited in *ibid.*
- 400 (349) *The Air Force had the lowest rate:* Cited in *ibid.*
- 400 (349) *Random urine tests of more than two thousand sailors:* The survey was conducted in December 1980. Cited in “Navy Is Toughening Enforcement Efforts Against Drug Abuse,” *New York Times*, July 10, 1981.
- 400 (349) *Meyer told the Milwaukee Journal:* See “Ex-GI Says He Used Hash at German Base,” *European Stars and Stripes*, December 18, 1974.
- 401 (349) *one out of every twelve ... was smoking hashish every day:* Cited in “Nuclear Base Men ‘Used Hash on Duty,’” *Miami News*, December 17, 1974.
- 401 (349) *“You get to know what you can handle”:* Quoted in “Ex-GI Says He Used Hash.” 401 (349) *thirty-five members of an Army unit ... using and selling marijuana and LSD:* See Flora Lewis, “Men Who Handle Nuclear Weapons Also Using Drugs,” *Boston Globe*, September 6, 1971.
- 401 (349) *Nineteen members of an Army detachment were arrested on pot charges:* See “GI’s at Nuclear Base Face Pot Charges,” *Los Angeles Times*, October 4, 1972.
- 401 (349–50) *Three enlisted men at a Nike Hercules base in San Rafael:* See “3 Atom Guards Called Unstable; Major Suspended,” *New York Times*, August 18,

- 1969; and “Unstable Atom Guards Probed,” *Boston Globe*, August 18, 1969.
- 401 (350) “*people from the Haight-Ashbury*”: Quoted in “Unstable Atom Guards.”
- 401 (350) *More than one fourth of the crew on the USS Nathan Hale*: Cited in “Men Who Handle Nuclear Weapons.” 401 (350) *A former crew member of the Nathan Hale told a reporter*: See *ibid.* The crew member of another ballistic missile submarine thought a reporter that smoking marijuana while at sea was too risky, because of the strong aroma. The tight quarters of the sub inspired an alternative. “I do uppers most of the time, but as a special treat, like when I’m on watch, I’ll do a little mescaline,” the crew member said. Quoted in Duncan Campbell, *The Unsinkable Aircraft Carrier: American Military Power in Britain* (London: Michael Joseph, 1984), p. 224.
- 401 (350) *The Polaris base at Holy Loch, Scotland*: See G. G. Giarchi, *Between McAlpine and Polaris* (London: Routledge & Kegan Paul, 1984), p. 197.
- 401 (350) *Nine crew members of the USS Casimir Pulaski*: See “Pot Smoking Sailors Go Home,” *Ocala [Florida] Star Banner*, January 24, 1977.
- 402 (350) *a local nickname: the USS Cannabis*: See Andrew McCallum, “Cowal Caught Between Polaris Sailors and McAlpine’s Fusiliers,” *Glasgow Herald*, April 26, 1984.
- 402 (350) “*a hippie type pad with a picture of Ho Chi Minh*”: Quoted in Lewis, “Men Who Handle Nuclear Weapons.” 402 (350) *151 of the 225 security police officers were busted*: See Clancy and Horner, *Every Man a Tiger*, p. 135.
- 402 (350) *Marijuana was discovered in one of the underground control centers of a Minuteman missile squadron*: See Bill Prochnau, “With the Bomb, There Is No Answer,” *Washington Post*, May 1, 1982. According to Prochnau, the arrest occurred in the late 1970s.
- 402 (350) *It was also found in the control center of a Titan II launch complex*: See “Marijuana Discovery Leads to Missile Base Suspensions,” *New York Times*, July 14, 1977; and “15 Suspended After Marijuana Is Found in Titan Silo,” *Los Angeles Times*, July 15, 1977.
- 402 (351) *roughly 114,000 people ... cleared to work with nuclear weapons*: Cited in Herbert L. Abrams, “Sources of Instability in the Handling of Nuclear

- Weapons,” in Frederic Solomon and Robert Q. Marston, eds., *The Medical Implications of Nuclear War* (Washington, D.C.: National Academy Press, 1986), p. 513.
- 402 (351) *1.5 percent lost that clearance because of drug abuse*: Of the 114,000 people certified that year under the Personnel Reliability Program, 1,728 lost their certification because of drug abuse—roughly 1.5 percent. See *ibid.*, p. 514.
- 402 (351) *Colonel John Moser had supervised a major drug bust*: Moser interview.
- 402 (351) *More than 230 airmen were arrested for using and selling*: See “Drug Probe at Whiteman Air Base,” *St. Joseph Missouri News Press*, September 9, 1979; and “Enlisted Airmen Suspended,” *Hutchinson [Kansas] News*, November 21, 1980.
- 403 (351) *Marijuana had been found in the control center at a Titan II complex*: Moser interview.
- 403 (351) *“inaccurate and unreliable”*: “Memorandum from the President’s Assistant for National Security Affairs (Kissinger) to President Nixon,” August 18, 1970, in United States State Department, *Foreign Relations of the United States, 1969–1976, Volume XXXIV: National Security Policy, 1969–1972*, (Washington, D.C.: Government Printing Office, 2011), p. 555.
- 403 (351) *a weapon system ... “which the Pentagon had been wanting to scrap”*: Henry A. Kissinger, *White House Years* (New York: Simon & Schuster, 1979), p. 1221.
- 403 (351) *Kissinger had offered a deal to the Soviet Union*: See Pincus, “Aging Titan II Was Time Bomb.” 403 (352) *“You Americans will never be able to do this to us again”*: Quoted in Trachtenberg, *History & Strategy*, p. 257.
- 404 (352) *increased the number of its long-range, land-based missiles from about 56 to more than 1,500*: See Zaloga, *Kremlin’s Nuclear Sword*, p. 241.
- 404 (352) *Its arsenal of submarine-based missiles rose from about 72 to almost 500*: See *ibid.*, p. 244.
- 404 (352) *a network of underground bunkers*: For a description of the bunker system, see *Soviet Military Power: An Assessment of the Threat* (Washington, D.C.: Government Printing Office, 1988), pp. 59–62. 353 *Kissinger was astonished by his first formal briefing on the SIOP*: See Burr ““Horror Strategy,”” pp. 38–52. For the strategic thinking of Nixon and Kissinger, I

relied largely on Burr's fine article and on Terry Terriff's *The Nixon Administration and the Making of U.S. Nuclear Strategy* (Ithaca: Cornell University Press, 1995).

- 405 (353) *The smallest attack option ... almost two thousand weapons*: Cited in "U.S. Strategic Objectives and Force Posture Executive Summary," National Security Council, Defense Program Review Committee, January 3, 1972 (top secret/declassified), NSA, p. 29.
- 405 (353) *the largest with more than three thousand*: Cited in *ibid.*, p. 28.
- 405 (353) *a "horror strategy"*: Quoted in Burr, "Horror Strategy," p. 63.
- 405 (353) *"how one rationally could make a decision"*: Kissinger was wondering how the Soviet Union could launch such an attack on the United States; but his doubts about the sanity of such a move applied equally to the American war plans of the time. "To have the only option that of killing 80 million people," he said at another meeting, "is the height of immorality." For the first quote, see "Review of U.S. Strategic Posture," NSC Review Group Meeting, May 29, 1969 (top secret/declassified), NSA, p. 12. For the second, see "Memorandum for Mr. Kissinger, Subject, Minutes of the Verification Panel Meeting Held August 9, 1973," August 15, 1973 (top secret /sensitive/code word/declassified), NSA, p. 8.
- 405 (353) *It was called Quick Count*: For information about the computer model, see N. D. Cohen, "The Quick Count System: A User's Manual," RAND Corporation, RM-4006-PR, April 1964. I learned about Quick Count from another report, one that was "designed to be of use to those who have only a rudimentary knowledge of targeting and the effects of nuclear weapons but who need a quick means of computing civil damage to Western Europe." See "Aggregate Nuclear Damage Assessment Techniques Applied to Western Europe," H. Avrech and D. C. McGarvey, RAND Corporation, Memorandum RM-4466-ISA, Prepared for the Office of the Assistant Secretary of Defense/International Security Affairs, June 1965 (for official use only/declassified). Between pages 19 and 23, you will find a guide to potential blast mortalities in the twenty-four largest cities in Western Europe, derived using Quick Count. The table listing the likely "Incremental Mortalities," "Weapon Order," and "Cumulative Mortalities" is a good example of calm, efficient, bureaucratic madness.

- 405 (354) *the “obstacle course to recovery”*: “Recovery from Nuclear Attack, and Research and Action Programs to Enhance Recovery Prospects,” Jack C. Greene, Robert W. Stokely, and John K. Christian, International Center for Emergency Preparedness, for Federal Emergency Management Agency, December 1979. The chart outlining the postattack obstacle course appears on page 7.
- 406 (354) *“No weight of nuclear attack which is at all probable”*: Ibid., pp. 22–23.
- 406 (354) *NATO nuclear policy “insists on our destruction”*: See “Minutes of the Verification Panel Meeting,” p. 2.
- 406 (355) *“I must not be—and my successors must not be”*: Quoted in Terriff, *Nixon and the Making of U.S. Nuclear Strategy*, p. 76.
- 407 (355) *General Bruce K. Holloway ... deliberately hid “certain aspects of the SIOP”*: Quoted in Burr, ““Horror Strategy,”” p. 62.
- 407 (355) *“with a high degree of confidence”*: Another top secret report found that, before the Soviet missiles hit, “it is possible that no President could be sure, with the present warning configuration, that an attack was in progress or that a retaliation was justified.” The first statement is quoted in Wainstain, et al., “Evolution of U.S. Strategic Command and Control,” p. 424; the second, in *ibid.*, p. 408.
- 407 (355) *The World Wide Military Command and Control System had grown to encompass*: Cited in “The Worldwide Military Command and Control System: A Historical Perspective (1960–1977),” Historical Division, Joint Secretariat, Joint Chiefs of Staff, September 1980 (secret/declassified), NSA, p. 121.
- 407 (355–56) *The National Emergency Airborne Command Post ... did not have a computer*: See “Countervailing Strategy Demands Revision of Strategic Forces Acquisition Plans,” Comptroller General of the United States, MASAD-81-355, August 1981, pp. 24–25.
- 408 (356) *the entire command-and-control system could be shut down*: See “Strategic Command, Control, and Communications: Alternative Approaches for Modernization,” Congress of the United States, Congressional Budget Office, October 1981, pp. 15–16; and May, et. al. “History of the Strategic Arms Competition”, Part 2, pp. 605–6.



- 408 (356) *The system had already proven unreliable*: For the growing problems with the WWMCCS, see “Worldwide Military Command and Control System: Historical Perspective,” pp. 93–112; and the chapter entitled “Three WWMCCS Failures,” in David Pearson, *The World Wide Military Command and Control System: Evolution and Effectiveness* (Maxwell Air Force Base, AL: Air University Press, 2000), pp. 71–92.
- 408 (356) *“A more accurate appraisal”*: Quoted in Wainstein, et al., “Evolution of U.S. Strategic Command and Control,” p. 432.
- 408 (356) *“confused and frightened men making decisions”*: May et al., “History of the Strategic Arms Competition, Part 2, p. 607.
- 410 (358) *Nixon tried to end the Vietnam War by threatening the use of nuclear weapons*: The details of this risky and unsuccessful plan can be found in Scott D. Sagan and J. Suri, “The Madman Nuclear Alert,” *International Security*, vol. 27, no. 4 (2003), pp. 150–83.
- 410 (358) *“I call it the Madman Theory, Bob”*: Quoted in *ibid.*, p. 156.
- 411 (358) *nuclear weapons were once again utilized as a diplomatic tool*: For the DEFCON 3 alert in 1973, see Scott D. Sagan, “Nuclear Alerts and Crisis Management,” *International Security*, vol. 9, no. 4 (Spring 1985), pp. 122–31.
- 411 (359) *the administration’s bold diplomacy*: The DEFCON 3 alert was part of a complex strategy aimed not only at the Soviet Union but also at the leadership of Egypt and Israel. Kissinger was pleased by the outcome, noting in his memoirs that “we had emerged as the pivotal factor in the diplomacy.” See Henry A. Kissinger, *Years of Upheaval* (New York: Simon & Schuster, 1982), p. 612.
- 411 (359) *“What seems ‘balanced’ and ‘safe’ in a crisis”*: Quoted in Sagan, “Alerts and Crisis Management,” p. 124.
- 411 (359) *He argued against the adoption of a launch-on-warning policy*: Iklé’s opposition to launching missiles quickly was part of a larger critique of American strategic policy. See Fred Charles Iklé, “Can Nuclear Deterrence Last Out the Century?” *Foreign Affairs*, January 1973, pp. 267–85.
- 411 (359) *“Launching the ICBM force on attack assessment”*: “The U.S. ICBM Force: Current Issues and Future Options,” C. H. Builder, D. C. Kephart, and A. Laupa, a report prepared for United States Air Force Project RAND,

- R-1754-PR, October 1975 (secret/formerly restricted data/ declassified), NSA, p. 81.
- 411 (359) “*accident-prone*”: See “Minutes, National Security Council Meeting, Subject, SALT (and Angola), December 22, 1975” (top secret/sensitive/declassified), NSA, p. 9.
- 411 (359) “*the Soviets must never be able to calculate*”: Ibid., p. 9.
- 412 (359) “*It is not to our disadvantage*”: Ibid.
- 412 (359) *a military aide carrying the “football”*: The contents of the president’s football were described in Bill Gulley, with Mary Ellen Reese, *Breaking Cover: The Former Director of the White House Military Office Reveals the Shocking Abuse of Resources and Power That Has Been the Custom in the Last Four Administrations* (New York: Simon & Schuster, 1980). Despite its lurid subtitle, the book probably offers the most accurate description of the football at the time.
- 412 (360) “*any emergency order coming from the president*”: See Carroll, *House of War*, p. 354–56. The quote is on page 355. For concerns about Nixon’s finger on the button, see also Janne E. Nolan’s fine book, *Guardians of the Arsenal: The Politics of Nuclear Strategy* (New York: New Republic Book, 1989), pp. 122–23. A number of the Joint Chiefs thought Schlesinger’s remark was a warning that Nixon might attempt a coup d’etat. See Mark Parry, *Four Stars: The Inside Story of the Forty-Year Battle Between the Joint Chiefs of Staff and America’s Civilian Leaders* (Boston: Houghton Mifflin, 1989), pp. 257–59

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- 413 (361) *General William E. Odom, attended briefings on the SIOP*: For his effort to change America’s nuclear plans, see William E. Odom, “The Origins and Design of Presidential Decision-59: A Memoir,” in Sokolski *Getting Mad*, pp. 175–96. 361 “*Limited Nuclear Options*” and “*Regional Nuclear Options*”: Ibid., pp. 176–77.
- 413 (361) “*At times I simply could not believe*”: Ibid., pp. 180, 183.
- 413 (362) “*absurd and irresponsible*”: Ibid., p. 194.

- 413 (362) *“the height of folly”*: Ibid.
- 413 (362) *The SIOP now called for the Soviet Union to be hit with about ten thousand nuclear weapons*: See “Retaliory Issues for the U.S. Strategic Nuclear Forces,” Congress of the United States , Congressional Buget Office, June 1978, p. 6.
- 414 (362) *“Things would just cease in their world”*: Sokolski, *Getting Mad*, p. 180.
- 414 (362) *Carter had met with the Joint Chiefs of Staff and asked*: See Carroll, *House of War*, pp. 362–64, and Thomas Powers, “Choosing a Strategy for World War III, *Atlantic Monthly*, November 1982.
- 414 (362) *He thought that one or two hundred missiles*: Right after taking office, President Carter asked Secretary of Defense Harold Brown to prepare a study of what would happen if the United States and the Soviet Union both possessed only 200 to 250 strategic missiles. The study addressed but failed to resolve one of the central questions of nuclear deterrence: How many weapons are enough? “Some have argued that the capability to destroy a single major city—such as Moscow or New York—would be sufficient to deter a rational leader,” the study said. “Others argue that a capability for assured destruction of 80 percent or more of the economic and industrial targets of adversaries is necessary and critical.” See Brian J. Auten, *Carter’s Conversion: The Hardening of American Defense Policy* (Columbia, MO: University of Missouri Press, 2008), p. 146; and “Memorandum for the President, Subject, Implications of Major Reductions in Strategic Nuclear Forces, From Harold Brown,” January 28, 1977 (secret/declassified), NSA, p. 2.
- 414 (362) *“the elimination of all nuclear weapons from this Earth”*: Carter had also called for the abolition of nuclear weapons in December 1974, when announcing his candidacy for president. See Auten, *Carter’s Conversion*, p. 95; and “Text of Inauguration Address,” *Los Angeles Times*, January 21, 1977.
- 415 (363) *“Why the Soviet Union Thinks It Could Fight and Win”*: Richard Pipes, “Why the Soviet Union Thinks It Could Fight and Win,” *Commentary*, July 1977, pp. 212–34.
- 415 (364) *To achieve a 95 percent certainty of wiping them out*: President Kennedy’s former science adviser, Jerome Wiesner, outlined how difficult it would be

for the Soviet Union to win a nuclear war against the United States. “Even after a surprise attack,” Wiesner observed, “*U.S. strength would actually be slightly greater than the Soviet Union’s.*” Indeed, if all the land-based missiles in the United States were destroyed, its submarine-based missiles could still hit the Soviet Union with 3,500 equivalent megatons—almost ten times the explosive force that the Kennedy administration had once thought sufficient to annihilate Soviet society. For these calculations, see Jerome Wiesner, “Russian and American Capabilities,” *Atlantic Monthly*, July 1982.

416 (364) *somewhere between two and twenty million Americans*: According to a study conducted in 1979 for the Senate Committee on Foreign Relations, a Soviet attack on missile silos and submarine bases in the United States would kill between 2 and 20 million people within a month. The wide range of potential fatalities was due to the unpredictability of fallout patterns, which would be largely determined by the wind, rain, and other weather conditions at the time of the attack. See “A Counterforce Attack Against the United States,” in “The Effects of Nuclear War,” Office of Technology Assessment, Congress of the United States, May 1979, pp. 81–90. The mortality estimates can be found on page 84.

416 (364) *a “countervailing strategy”*: In July 1980, President Carter endorsed a new and top secret “Nuclear Weapons Employment Policy.” Known as Presidential Directive/NSC-59, it called for a shift in targeting—a renewed emphasis on counterforce, limited war, and the destruction of Warsaw Pact forces while they moved on the battlefield. It sought to “countervail,” to resist with equal strength, any Soviet attack. It also sought to provide Carter with the ability to launch on warning. See Odom, “The Origins and Design of Presidential Decision-59,” and “Presidential Directive/ NSC-59,” July 25, 1980 (top secret/sensitive/declassified), NSA.

416 (364) *The MX missile system embodied the strategic thinking*: For the clearest description of the Carter administration plan for the MX, see “MX Missile Basing,” Congress of the United States, Office of Technology Assessment, September 1981. And for a sense of the missile debates at the time, see John D. Steinbruner and Thomas M. Garwin, “Strategic Vulnerability: The Balance Between Prudence and Paranoia,” *International Security*, vol. 1, no.

- 1 (Summer 1976), pp. 138–81; William C. Potter, “Coping with MIRV in a MAD World,” *Journal of Conflict Resolution*, vol. 22, no. 4(1978), pp. 599–626; Wayne Biddle, “The Silo Busters: Misguided Missiles, the MX Project,” *Harper’s*, December 1979; and William H. Kincade, “Will MX Backfire?,” *Foreign Policy*, no. 37 (Winter 1979–1980), pp. 43–58.
- 417 (365) *scattered across roughly fifteen thousand acres*: See “MX Missile Basing,” pp. 64-65.
- 417 (365) *Eight thousand miles of new roads*: Cited in *ibid.*, p. 61.
- 417 (365) *About a hundred thousand workers would be required*: Cited in *ibid.*, p. 75.
- 417 (365) *The total cost of the project was estimated to be at least \$40 billion*: *Ibid.*, pp. 13–14.
- 417 (365) *the computers at the NORAD headquarters*: For the November false alarm, see “NORAD’s Missile Warning System: What Went Wrong?,” Comptroller General of the United States, Report to the Chairman, Committee on Government Operations, House of Representatives, Comptroller General of the United States, MASAD-81-30, May 15, 1981; “Report on Recent False Alerts from the Nation’s Missile Attack Warning System,” U.S. Senate, Committee on Armed Services, Ninety-sixth Congress, First Session, October 9, 1980; and Scott D. Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* (Princeton: Princeton University Press, 1993), pp. 225–31.
- 418 (365) *about four times a day*: There were 1,544 “routine” missile display conferences in 1979. Cited in “Report on Recent False Alerts,” p. 4.
- 418 (365) *triggered by forest fires, volcanic eruptions*: *Ibid.*
- 418 (365–66) *a Threat Assessment Conference ... once or twice a week*: *Ibid.*, p. 5.
- 418 (366) *a Missile Attack Conference had never been held*: *Ibid.*
- 419 (366) *A technician had put the wrong tape into one of NORAD’s computers*: According to a subsequent investigation, “test scenario data was inadvertently fed into the online missile warning computers which generated false alarms.” One could also argue that it was right tape—inserted in the wrong place at the wrong time. See “NORAD’s Warning System: What Went Wrong?,” p. 13. See also A. O. Sulzberger, Jr., “Error Alerts U.S. Forces to a False Missile Attack,” *New York Times*, November 11, 1979.

- 419 (366) *The computers at NORAD had been causing problems:* See “NORAD’s Information Processing Improvement Program—Will It Enhance Mission Capability?,” Controller General of the United States, Report to the Congress, September 21, 1978.
- 419 (366–67) *the Honeywell 6060 computers were already obsolete:* See “NORAD’s Warning System: What Went Wrong?,” p. 8.
- 419 (367) *despite protests from the head of NORAD that they lacked sufficient processing power:* See “NORAD’s Information Processing Improvement Program,” pp. 13–14.
- 419 (367) *“ due to the lack of readily available spare parts”:* Ibid., p. 7.
- 419 (367) *Many of the parts hadn’t been manufactured by Honeywell for years:* Ibid.
- 419 (367) *twenty-three security officers ... stripped of their security clearances:* See “AF Guards Disciplined in Drug Probe,” *Washington Post*, January 17, 1980.
- 419 (367) *“false alarm on attack sends fighters into sky”:* See “False Alarm on Attack Sends Fighters into Sky,” *New York Times*, November 10, 1979.
- 419 (367) *Zbigniew Brzezinski ... was awakened by a phone call:* For the details of Brzezinski’s early-morning call, see Robert M. Gates, *From the Shadows: The Ultimate Insider’s Story of Five Presidents and How They Won the Cold War* (New York: Simon & Schuster, 2006), pp. 114–15. Gates tells the story well but conflates the cause of the June false alarm with that of the previous one in November. I tried to confirm the story with Brzezinski, who declined to be interviewed for this book. But he did discuss the incident with Admiral Stansfield Turner, the director of the CIA at the time. See Stansfield Turner, *Caging the Nuclear Genie: An American Challenge for Global Security* (New York: Westview Press, 1997), p. 17.
- 420 (368) *2,200 missiles were heading toward the United States:* See Gates, *From the Shadows*, p. 114; Turner, *Caging the Nuclear Genie*, p. 17; Sagan, *Limits of Safety*, pp. 231–32.
- 420 (368) *a defective computer chip in a communications device:* See “Report on Recent False Alerts,” p. 7.
- 420 (368) *The faulty computer chip had randomly put the number 2:* Ibid.
- 421 (368) *at a cost of forty-six cents:* Cited in “Missile Alerts Traced to 46 Item,” *New York Times* June 18, 1980.

- 421 (369) *Bob Peurifoy became concerned*: Peurifoy interview.
- 422 (370) *“It’s our stockpile. We think it’s safe.”*: Peurifoy interview. Stevens confirmed that response. 370 *“the magnitude of the safety problems”*: This quote comes from a document that Peurifoy used during briefings on nuclear weapon safety at Sandia. On a single page, he assembled quotations from the Department of Defense, the Air Force, and others asserting that the American nuclear stockpile was safe. The original sources, from which the quotes have been drawn, are on file at Sandia. I feel confident that these quotes are accurate. On page 116 of “Origins and Evolution of S2C,” Stevens writes that the Pentagon’s response to the Fowler Letter “can be characterized as mostly delaying actions in the guise of requiring safety studies of each of the weapons involved.” 423 (370) *“The safety advantages gained by retrofitting”*: Quoted in “Sandia briefing document.” 423 (371) *Modification of any current operational aircraft*: Quoted in *ibid.*
- 423 (371) *a six-digit code with a million possible combinations*: See “Command and Control Systems for Nuclear Weapons,” p. 40.
- 423 (371) *the Air Force put a coded switch in the cockpit*: *Ibid.*, p. 12.
- 423 (371) *The combination ... was the same at every Minuteman site*: Bruce G. Blair first disclosed this fact in 2004, and the easy-to-remember combination was confirmed for me by a Sandia engineer.
- 424 (372) *cost ... was about \$100,000 per weapon*: Peurifoy interview.
- 424 (372) *cost about \$360 million*: *Ibid.*
- 425 (372) *“My dissenting opinion will be brief”*: The cartoonist was Sidney Harris, and the cartoon originally appeared in *Playboy*, March 1972, p. 208.
- 426 (373) *During the late 1960s, Stevens had begun to worry*: Stevens interview.
- 426 (373) *Nozzles on the walls*: The system was called the “sticky foam personnel barrier.” In addition to sticky foam, other “active barriers” were considered as a means of protecting nuclear weapons, including cold smoke, aqueous foam, and rigid foam. For a comparison of these active barriers and their merits, see “An Activated Barrier for Protection of Special Nuclear Materials in Vital Areas,” Ronald E. Timm, James E. Miranda, Donald L. Reigle, and Anthony D. Valente, Argonne National Laboratory, 1984.
- 426 (374) *Stan Spray found that one of the bomb’s internal cables*: Peurifoy and Stevens interviews.

- 428 (375)        *“base escape”*: How long a B-52’s engines took to start was one of the most important determinants of whether the plane would get into the air before Soviet missiles arrived—or get destroyed on the ground. For some of the other factors, see “Nuclear Hardness and Base Escape,” Rayford P. Patrick, Engineering Report No. S-112, Headquarters Strategic Air Command, Directorate of Aircraft Maintenance, March 31, 1981.
- 428 (375)        *“our B-52s are planned for one-way missions”*: See “Minutes, National Security Council Meeting, Subject, SALT (and Angola), December 22, 1975” (top secret/sensitive/declassified), NSA, p. 5.
- 429 (376)        *A study of all the nuclear weapons in the American arsenal*: A portion of the study has been declassified, and I’ve filed a Freedom of Information Act request to obtain the rest of it: “An Examination of the U.S. Nuclear Weapon Inventory,” R. N. Brodie, November 30, 1977 (secret/ restricted data).
- 429 (376)        *The Mark 28 bomb was at the top of the list*: Ibid.
- 429 (376)        *a “retrofit for Enhanced Electrical Safety*: Ibid.
- 429 (376)        *it planned to spend at least \$10 billion to equip B-52s*: Cited in “Pentagon Says Even Vast Effort by Soviet Can’t Stop New Missile,” *New York Times*, November 15, 1978.
- 430 (377)        *Jeffrey A. Zink was pulling an alert*: My account of the Grand Forks accident is based on an interview with Jeffrey A. Zink and on “USAF Mishap Report, Parking Spot A-10, Grand Forks Air Force Base,” Headquarters, Fifteenth Air Force, September 29, 1980.
- 430 (378)        *“What have I gotten myself into?”*: Zink interview.
- 431 (378)        *“I’ll throw up later”*: Ibid.
- 432 (379)        *“we’re going to die”*: Ibid.
- 432 (379)        *“Oh my God, it’s the real thing”*: Ibid.
- 433 (380)        *“I can’t do this”*: Quoted in *ibid*.
- 434 (380)        *“Alpha, Charlie, Delta ...”*: Quoted in *ibid*.
- 434 (380)        *“Terminate, terminate, terminate”*: Quoted in *ibid*.
- 435 (381)        *“Get in”*: Quoted in *ibid*.
- 435 (381)        *gusts of up to thirty-five miles an hour*: The mishap report cited gusts of up to thirty knots, and a knot is about 1.15 miles per hour. “USAF Mishap Report,” p. 1.



- 435 (381) *Tim Griffis was at home with his family*: Interview with Tim Griffis.
- 436 (382) “*What do you think?*”: Quoted in Griffis interview.
- 436 (383) “*Yeah, let me try it*”: Ibid.
- 437 (383) “*Gene, you want to go with me?*”: Ibid.
- 437 (383) “*Yeah*”: Ibid.
- 437 (383) “*Chief, that engine is getting pretty hot*”: Quoted in “USAF Mishap Report,” p. N-6.
- 437 (383) “*Yeah, go*”: Quoted in *ibid.*, p. N-6.
- 437 (384) “*Here, somebody wants to talk to you*”: Quoted in Griffis interview.
- 437 (384) “*Mr. Griffis, I want to thank you*”: Quoted in *ibid.*
- 438 (384) *During a closed Senate hearing, Dr. Roger Batzel*: See Reed Karaim, “Nearly a Nuclear Disaster— Wind Shifted Fire on B-52 Away from Bomb, Experts Say,” *Seattle Times*, August 13, 1991. A map showed the potential contamination area.
- 438 (384) *the cause of the fire in engine number five*: In addition to nearly contaminating Grand Forks with plutonium and/or causing a nuclear detonation nearby, the missing nut caused \$442,696 worth of damage to the plane. See “B52H S/N 60-0059 Mishap Engine Investigation” and “Certificate of Damage,” in “USAF Mishap Report.” 438 (385) *Senator David Pryor once again introduced an amendment*: See Congressional Record—Senate, September 16, 1980, pp. 25468–25470.
- 438 (385) *at least nine accidents or propellant leaks*: Cited in *ibid.*, p. 25469. See also Tom Hamburger and Elizabeth Fair, “9 Accidents Recorded in State Since January 1978,” *Arkansas Gazette*, September 28.
- 439 (385) *At a launch complex near Heber Springs*: See Hamburger and Fair, “9 Accidents Recorded” and Pincus “Aging Titan II Was Time Bomb.”
- 439 (385) *More than one third of the entire Titan II force*: Cited in Pincus “Aging Titan II Was Time Bomb.”
- 439 (385) “*We have a responsibility to protect the civilians*”: Congressional Record, p. 25468.
- 439 (385) “*Accidents have occurred in the past*”: Ibid.
- 439 (385) *The Air Force had recently submitted a lengthy report*: “Assessment Report: Titan II LGM 25 C, Weapon Condition and Safety,” Prepared for

- the Senate Armed Services Committee and House Armed Services Committee, May 1980.
- 439 (385) *the accident rate at Titan II sites*: Cited in *ibid.*, p. 1.
- 439 (385) “*provide a high level of safety*”: *Ibid.*, p.3.
- 439 (385) “*considered by many to be better now than when it was new*”: *Ibid.*, pp. 2–3.
- 439 (385) *The safety record of the W-53 warhead was “commendable”*: *Ibid.*, Appendix C, p. 38.
- 440 (386) “*Airframe rupture*”: *Ibid.*, p. 9.
- 440 (386) *They were being sued by Airman Carl Malinger*: The lawsuits filed by Malinger and the widows of Erby Hepstall and Robert J. Thomas were later settled out of court. According to one news account, the defense contractors agreed to pay Malinger and the other plaintiffs about \$500,000 each. See “*Lawsuits from ’78 Titan Accident Settled Out of Court by Air Force*,” *Lawrence (Kansas) Journal-World*, January 8, 1981.
- 440 (386) *Skip Rutherford and his wife were at home*: Rutherford interview.
- 440 (386) “*This is serious*”: *Ibid.*
- 440 (386) “*Well, how serious?*”: Quoted in *ibid.*
- 440 (386) “*They tell me it’s going to explode*”: *Ibid.*
- 440 (386) “*You’re kidding me*”: Quoted in *ibid.*
- 441 (387) “*Bob, listen to me*”: *Ibid.*
- 441 (387) “*What?*”: Quoted in *ibid.*
- 441 (387) “*Tell Frank to get the hell out*”: *Ibid.*
- 441 (387) “*How do you know?*”: Quoted in *ibid.*
- 441 (387) “*You have your sources*”: *Ibid.*

## BEÄNGSTIGEND

- 442 (388) *Greg Devlin and Rex Hukle took turns*: Greg Devlin interview.
- 442 (389) *Jeff Kennedy thought the whole plan was idiotic*: Kennedy interview.
- 446 (392) *For the next eight minutes, the command post did not hear a word*: “*Report, Major Missile Accident, Titan II Complex 374-7*,” Statement of Jimmy D. Wiley, Staff Sergeant, Tab U-100, p. 3.

- 446 (392) *Moser thought the warhead had detonated*: Moser interview.
- 447 (393) *“Get out of here, get out of here”*: King interview.
- 448 (394) *“We just left a bunch of dead people back there”*: Ibid.
- 448 (394) *“Hop in here”*: Hutto interview.
- 449 (395) *“Evacuate, evacuate”*: “Report, Major Missile Accident, Titan II Complex 374-7,” Statement of Thomas A. Brocksmith, Technical Sergeant , Tab U-9, p. 4.
- 450 (396) *“I need to get the hell out of here”*: Holder interview.
- 451 (397) *“Screw you”*: Sandaker interview.
- 451 (397) *I just want everything to stop falling*: “Report, Major Missile Accident, Titan II Complex 374-7,” Statement of Archie G. James, Staff Sergeant , Tab U-42, p. 2.
- 452 (398) *“Oh shit, you ain’t gonna live through this”*: Devlin interview.
- 452 (398) *“Run, Run!”*: Ibid.
- 453 (399) *“Oh, my God”*: Ibid.
- 453 (399) *“Please help, I can’t move”*: “Report, Major Missile Accident, Titan II Complex 374-7,” Statement of John G. Devlin, Senior Airman, Tab U-18, p. 4.
- 455 (399) *“I have to put you down”*: Quoted in Devlin interview.
- 455 (401) *“Get away from there”*: Childers interview.
- 456 (401) *“Let’s go, let’s get out of here”*: Ibid., and “Report, Major Missile Accident, Titan II Complex 374-7,” Statement of Gene M. Schneider, Airman First Class, Tab U-87, p. 3.
- 458 (402) *“Well, at least I’ve still got the hair on my arms”*: Quoted in *ibid.*, Statement of Allan D. Childers, First Lieutenant, Tab U-13, p. 6.
- 458 (404) *“Man, ain’t that pretty”*: Ibid., Statement of Jimmy E. Roberts, Technical Sergeant, p. 2.
- 458 (405) *“I’m not going to leave”*: Quoted in Green interview.
- 458 (405) *“Help! Help me. Help me! Can anybody read me?”*: Don Green obtained a recording of the radio communications at Launch Complex 374-7 after the accident. The recording was made by a civilian and then given anonymously to KATV-TV in Little Rock. Partial transcripts were also published in the newspaper: “Radio Conversations Detail Rescue Effort by Air Force,”

- Arkansas Gazette*, September 20, 1980. I'm grateful to Green for making a copy of the tape for me. Kennedy's plea for help can be heard on it.
- 458 (405) "Yes, we can hear you": Transcript, Air Force Radio Traffic, September 19, 1980.
- 459 (405) "Help me!": Ibid.
- 459 (405) "Where are you?": Ibid.
- 459 (405) "Where are you, Jeff?": Ibid.
- 459 (405) "Colonel Morris, I'm down here": Ibid.
- 459 (405) "Where are you?": Ibid.
- 459 (405) "I'm down here in your truck!": Ibid.
- 460 (406) "I am not going to die on this complex": Kennedy interview.
- 460 (407) "Oh, my God, help me": Quoted in Kennedy interview.
- 460 (407) "Livy, I'm going for help": Ibid., and "Report, Major Missile Accident, Titan II Complex 374-7," Statement of Jeffrey K. Kennedy, Sergeant, Tab U-46, p. 14.
- 461 (407) "Oh, my God, help me": Kennedy interview.
- 461 (407) "Please, somebody help me": Ibid.
- 462 (408) "Help": Quoted in "Report, Major Missile Accident, Titan II Complex 374-7," Statement of George H. Short, Captain, Tab U-90, p. 3.
- 462 (408) "Captain": Quoted in *ibid.*
- 464 (411) "Okay, keep on yelling": Ibid., Roberts statement, Tab U-77, p. 4.
- 465 (412) "Look, we're going to make it out of here": Ibid., Roberts statement, Tab U-77, p. 5. 412 "Please don't leave me": Quoted in *ibid.*, Roberts statement, Tab U-77, p. 5.
- 466 (412) "Great": Ibid., Roberts statement, Tab U-77, p. 5.
- 466 (413) "Please don't tell my mother": Sandaker interview.

## WEDER BESTÄTIGEN NOCH DEMENTIEREN

- 469 (415) *Matthew Arnold was taught how to deactivate*: Interview with Matthew Arnold.
- 469 (415) "Chlorine is your friend": Quoted in *ibid.*

- 469 (415) *About one third of the students typically flunked out:* My description of the course work at Redstone and Indian Head is based not only on my interview with Arnold but also on interviews with other EOD technicians who studied at both places during roughly the same period. I also learned a few things about bomb disposal from Peurifoy and Stevens.
- 472 (418) *SAC headquarters wouldn't even tell Frank Wilson:* See "Local Officials Couldn't Get Information from Military," *Arkansas Gazette*, September 20, 1980.
- 473 (419) *the whereabouts of "the warhead":* Transcript, Air Force Radio Traffic.
- 473 (419) *"Hey, I need one of them masks":* Anglin interview.
- 473 (419) *"Oh, you don't need a mask":* Quoted in *ibid.*
- 476 (421) *"dry land drowning":* See "Fact Sheet, Phosgene Carbonyl Chloride, Military Designations: CG," U.S. Army Chemical Materials Agency (n.d.).
- 479 (424) *"It's laying in a ditch":* Transcript, Air Force Radio Traffic.
- 479 (424) *"Okay, I'd recommend that we wait":* *Ibid.*
- 479 (424) *"Fine with me":* *Ibid.*
- 480 (424) *"Goddamn it, Harold, I'm the vice president":* This anecdote was told to me by Senator David Pryor and later confirmed by Vice President Walter Mondale.
- 480 (425) *Peurifoy didn't like hearing that bit of information:* My account of the accident response and render safe procedures at Damascus is based on interviews with Bob Peurifoy, William H. Chambers. Matt Arnold, and other EOD technicians.
- 480 (425) *None of the work at Los Alamos and NEST had made Chambers feel anxious:* Chambers interview.
- 484 (429) *About a dozan people in Guy, Arkansas:* See Art Harris, "Residents Near Site of Missile Explosion Complain of Illness," *Arkansas Democrat*, September 26, 1980.
- 485 (429) *"The Air Force wouldn't tell us a damn thing":* Quoted in "Air Force Says 'No' to Plea for Inspection," *Arkansas Democrat*, September 21, 1980.
- 485 (429) *Gary Gray ... said that he learned more from the radio:* See Lamar James, "Civilians 'Got Cold Shoulder' from Military, Deputy Says," *Arkansas Gazette*, September 21, 1980.

- 485 (429) *security police stopped Tatom on the access road*: See “Air Force says ‘No’ to Plea for inspection.” 486 (430) *doing “the best they could”*: Quoted in Don Johnson, “Clinton to Talk to Air Force Officials,” *Arkansas Democrat*, September 21, 1980.
- 486 (430) *“I assume they’re armed”*: Quoted in “Mondale Avoids Admitting Missile Armed with Warhead,” *Arkansas Gazette*, September 20, 1980.
- 486 (430) *“I believe that the Titan missile system is a perfectly safe system”*: “Transcript, News Conference by Secretary of the Air Force Hans Mark, Friday, September 19, 1980, 4:00 p.m., the Pentagon,” David H. Pryor Papers, University of Arkansas, Fayetteville.
- 486 (430) *“Accidents happen”*: Ibid.
- 486 (430) *“pretty much the worst case”*: Ibid.
- 486 (430) *“the emergency teams whose job it is”*: Ibid.
- 486 (430) *“the emergency procedures worked properly”*: Ibid.
- 487 (431) *the Titan II accident ... was its first big, breaking story*: CNN was the only national news network with a live camera at the sight. See Reese Schonfeld, *Me Against the World: The Unauthorized Story of the Founding of CNN* (New York: Cliff Street, 2001), pp. 182–86.
- 487 (431) *“as a means of reducing or preventing widespread public alarm”*: Quoted in Ellen Debenport, “Air Force Could Have Confirmed Warhead’s Presence,” *United Press International*, September 26, 1980.
- 487 (431) *A newspaper cartoon depicted three Air Force officers*: See “The Air Force on Nukes,” *Arkansas Gazette*, September 24, 1980. 432 *“If you’re on the military’s side”*: Art Buchwald, “Arrivederci, Arkansas,” *Los Angeles Times*, October 2, 1980.
- 487 (432) *“a nuclear conflict”*: Quoted in “Russians Say Accidental Nuclear Explosion Could Touch Off War,” *Associated Press*, September 21, 1980.
- 488 (432) *“If it’s not safe and effective”*: Quoted in “Congressman Wants Inquiry of Missile Silos,” *Arkansas Democrat*, September 20, 1980.
- 488 (432) *“Hey, Colonel, is that what you won’t confirm or deny?”*: Quoted in “Titan Warhead Taken to Air Base,” *Arkansas Gazette*, September 23, 1980.

## DAS ENDE

- 489 (433) *Reagan soundly defeated Jimmy Carter*: Reagan got about 51 percent of the popular vote and 489 electoral votes; Carter about 41 percent, and 49 electoral votes. For a contemporary view of the political implications, see David S. Broder, “A Sharp Right Turn: Republicans and Democrats Alike See New Era in ’80 Returns,” *Washington Post*, November 6, 1980.
- 489 (433) “*Peace through strength*”: Quoted in Lou Cannon, “Reagan Assures VFW He’ll Restore Defenses,” *Boston Globe*, August 19, 1980.
- 489 (433) *America’s defense budget would almost double*: In 1980, the United States spent about \$134 billion on defense; it spent about \$253 billion in 1985. And the following year, it spent about \$273 billion. Cited in “National Defense Budget Estimates for FY 2013,” Table 7-1, p. 247.
- 489 (434) *Reagan opposed not only détente*: For the origins of Reagan’s anti-Communism and his opposition to arms control agreements with the Soviet Union, see Paul Lettow, *Ronald Reagan and His Quest to Abolish Nuclear Weapons*, (New York: Random House, 2005), pp. 10–18.
- 489 (434) “*motivated by fear of the bomb*”: Quoted in *ibid.*, p. 15.
- 490 (434) “*the most evil enemy*”: Quoted in *ibid.*, p. 17.
- 490 (434) *Iklé was still haunted*: Iklé interview.
- 490 (434) “*assured genocide*”: Iklé, “Can Nuclear Deterrence Last Out the Century?,” p. 281.
- 490 (434) a “*form of warfare universally condemned*”: *Ibid.*, p. 281.
- 491 (435) “*an auto-da-fé*”: Fred C. Iklé, “The Prevention of Nuclear War in a World of Uncertainty,” *Policy Sciences*, vol. 7, no. 2 (1976), p. 250.
- 491 (435) *Two Air Force reports on the Titan II*: “Report of Missile Accident Investigation: Major Missile Accident, 18–19 September 1980, Titan II Complex 374-7, Assigned to 308th Strategic Missile Wing, Little Rock Air Force Base, Arkansas,” Conducted at Little Rock Air Force Base, Arkansas, and Barksdale Air Force Base, Louisiana, December 14–19, 1980, Eighth Air Force Missile Investigation Board, December 1980; and “Titan II Weapon System: Review Group Report,” December 1980.
- 491 (435) *destroyed by three separate explosions*: See “Report, Major Missile Accident, Titan II Complex 374-7,” pp. 18–20; Tab I-8, pp. 1–4.

- 491 (435) *“It may not be important whether the immediate cause”*: Ibid., Tab I-8, pp. 2–3.
- 492 (436) *the vapor detectors ... were broken 40 percent of the time*: Cited in “Titan II Review Group Report,” pp. 16, B-7, C-25.
- 492 (436) *the portable vapor detectors rarely worked*: Ibid., pp. 17, B-8.
- 492 (436) *the radio system...was unreliable*: Ibid., pp. B-8, B-9, C-29.
- 492 (436) *missile combat crews should be discouraged from evacuating*: Ibid., pp. B-9, B-10.
- 492 (436) *the shortage of RFHCO suits often forced maintenance teams*: Ibid., p. C-28.
- 492 (436) *the suits and helmets were obsolete*: Ibid., pp. 17, C-40.
- 492 (436) *the air packs were obsolete*: Ibid., p. C-40.
- 492 (436) *some of the missile’s spare parts were either hard to obtain*: Ibid., p. C-35.
- 492 (436) *security police officers should always be provided with maps*: Ibid., pp. E-73, E-74.
- 492 (436) *“modern safing features” should be added to the W-53 warhead*: Ibid., p. D-4.
- 492 (436) *“modern nuclear safety criteria for abnormal environments”*: Ibid.
- 492 (436) *a warning siren at every launch complex might be useful*: Ibid., p. 33.
- 492 (436) *“potentially hazardous” ... but “basically safe”*: Ibid., p. 1.
- 492 (436) *“supportable now and in the foreseeable future”*: Ibid., p. x. 436 *Jeff Kennedy was angered by both of the reports*: Kennedy interview.
- 492 (436) *guidance in the medical literature was scarce*: One of the few good studies on the danger of the oxidizer happened to be published during the same week as the explosion at Launch Complex 374-7. It was written by Air Force physicians. See “The McConnell Missile Accident: Clinical Spectrum of Nitrogen Dioxide Exposure,” Lieutenant Colonel Charles C. Yockey, MC, USAF; Major Billy M. Eden, MC, USAF; Colonel Richard B. Byrd, MC, USAF, *Journal of the American Medical Association*, vol. 244, no. 11 (September 12, 1980).
- 492 (436) *nobody from the Air Force would speak to him, for three days after the accident*: Anderson later told Morley Safer, a correspondent for *60 Minutes*, that the Air Force didn’t share information about how to treat victims of



- oxidizer exposure until “three or four days” after the Damascus accident. Anderson was interviewed for “Titan,” *60 Minutes*, November 8, 1981.
- 493 (436) *“Do not operate the switch”*: “Report, Major Missile Accident, Titan II Complex 374-7,” Statement of Michael A. Hanson, Tab U-30, p. 7.
- 493 (437) *Kennedy thought the report was wrong*: Kennedy interview.
- 494 (437) *Powell ... blamed himself for Livingston’s death*: Powell interview.
- 494 (438) *Jeff Kennedy was served with a formal letter of reprimand*: For the reprimands sent to Kennedy and see Richard C. Gross, “Titan Accident: Air Force Reprimand for Heroics,” *United Press International*, February 12, 1981; and Walter Pincus, “‘Hero’ of Titan II Missile Explosion Is Reprimanded by Air Force,” *Washington Post*, February 12, 1981.
- 494 (438) *Air Force regulations permitted a violation of the two-man rule*: In fact, a SAC training video about the Titan II encouraged airmen to break the rule in certain situations. According to the narrator of the video: “Under normal operating conditions, a solitary individual is never allowed inside a no-lone zone. However, during an actual emergency, a lone individual may have to take action to save lives or equipment, if at all possible. If you are working near a no-lone zone and see an emergency in that zone, you will be expected to take action *by yourself* to save the critical component or other equipment from damage, if possible. Yes, your action will be in direct violation of the SAC two-man policy, and you will have to report it as such. However, your action—provided it is taken under an emergency condition—is expected and condoned.” This “exception” to the rule is explained in “Nuclear Surety Program, Initial Training, Part 1: History—An Overview,” Aerospace Audiovisual Service, U.S. Air Force, (n.d.). The tape can be found in the archives of the Titan Missile Museum. According to the museum’s archivist and historians, Chuck Penson, the video was most likely recorded some time between 1976 and 1979.
- 495 (438) *David Powell was given an Article 15 citation*: Powell wasn’t charged with using a ratchet instead of a torque wrench—because the socket fell off before the ratchet could be “used.” See Carol Griffiee, “Airman at Silo Is Disciplined,” *Arkansas Gazette*, February 13, 1981.
- 495 (438) *placed in the psychiatric ward there—along with Greg Devlin*: Kennedy and Devlin interviews.

- 495 (439) *Bill Carter ... an Air Force veteran and a former Secret Service agent:* Carter spoke to me at length about his dealings with the Air Force over its management of the Titan II missiles in Arkansas.
- 496 (439) *“a substance no more dangerous than smog”:* Quoted in Bill Carter and Judi Turner, *Get Carter: Backstage in History from JFK’s Assassination to the Rolling Stones* (Nashville: Fine’s Creek Publishing, 2006), p. 208.
- 496 (439) *A few months later, at a ceremony in Little Rock:* Kennedy, Devlin, and Sandaker interviews. See also Walter Pincus, “Eight Honored as Heroes in ’80 Titan Missile Blast,” *Washington Post*, May 23, 1981.
- 496 (439) *his local congressman in Maine, David Emery, said that if he took the medal:* Kennedy interview. See also John S. Day, “Behind an Effective Lawmaker—a Good Staff,” *Bangor Daily News*, March 19, 1982.
- 496 (440) *a “temporary medical leave by reason of disability”:* Quoted in *ibid.*
- 497 (440) *Devlin got a check for \$6,400:* Devlin interview.
- 497 (440) *A study commissioned by the Air Force later questioned:* Peurifoy interview.
- 497 (440) *“expedite the proposed retrofit of the 28”:* “Letter, To Lieutenant General Howard W. Leaf, Inspector General, Headquarters, United States Air Force, From Harold P. Smith, Jr., President, the Palmer Smith Corporation, July 17, 1981” (secret/restricted data/declassified), p. 2.
- 498 (441) *Peurifoy quietly arranged for a unique signal generator:* Peurifoy interview. *441 expected to cost approximately \$1.5 trillion:* Cited in “Economy Can’t Absorb Defense Increase,” *Washington Post*, October 18, 1981.
- 498 (441) *About \$250 billion would be spent on nuclear weapon systems:* Cited in “Modernizing U.S. Strategic Offensive Forces: The Administration’s Program and Alternatives,” A CBO Study, Congressional Budget Office, Congress of the United States, May 1983, p. 1.
- 498 (441) *about fourteen thousand strategic warheads and bombs, an increase of about 60 percent:* The Reagan administration planned to raise the number of warheads from 8,800 to 14,000. Cited in *ibid.*, p. xvi.
- 499 (442) *a “super-sudden first strike”:* See McGeorge Bundy, “Common Sense and Missiles in Europe,” *Washington Post*, October 20, 1981.

- 499 (442) *the “ highest priority element”*: Quoted in Pearson *WWMCCS: Evolution and Effectiveness*, p. 264.
- 499 (442) *“This system must be foolproof ”*: “Text of the President’s Defense Policy Statement: ‘Our Plan’ to ‘Strengthen and Modernize the Strategic Triad ... ,” *Washington Post*, October 3, 1981.
- 499 (442) *greater “ interoperability”*: Statement of Donald C. Latham, Deputy Undersecretary of Defense (Communications, Command, Control and Intelligence), in “Strategic Force Modernization Programs,” Hearings Before the Subcommittee on Strategic and Theater Nuclear Forces of the Committee on Armed Services, United States Senate, Ninety-seventh Congress, First Session, 1981, p. 239.
- 499 (442) *“to recognize that we are under attack”*: Quoted in Bruce G. Blair, *Strategic Command and Control: Redefining the Nuclear Threat* (Washington, D.C.: Brookings Institution, 1985), p. 264.
- 499 (442) *an unprecedented investment in command and control*: Iklé understood, more than most officials at the Pentagon, the fundamental importance of the nuclear command-and-control system. Once again, a new administration was greeted by the news that the United States lacked the ability to control its strategic forces after a surprise attack by the Soviet Union. A study conducted in the spring of 1981 by Dr. James P. Wade, Jr., an undersecretary of defense, found that the commandand- control system could not assure “an effective initial response to a nuclear attack on the United States”; could not fight a protracted nuclear war; and could not guarantee the “survivability, durability, or connectivity of the national command authority function.” The implications of the Wade study were, essentially, the same as those of WSEG R-50 more than twenty years earlier: the only nuclear war that the United States could hope to win would be one in which it launched first. The quotations in my account of the Wade study are not from the actual document. They come from a summary of it in a document recently obtained by the National Security Archive. See “A Historical Study of Strategic Connectivity, 1950–1981,” Joint Chiefs of Staff Special Historical Study, Historical Division, Joint Chiefs of Staff, July 1982 (top secret/declassified), NSA, pp. 64–65.

- 499 (442) *spending about \$18 billion*: Cited in John D. Steinbruner, “Nuclear Decapitation,” *Foreign Policy*, no. 45 (Winter 1981–2), p. 25.
- 500 (442) *an expansion of Project ELF*: For details of the Navy’s ambitious schemes, see Pearson, *WWMCCS: Evolution and Effectiveness*, pp. 287–89; and Lowell L. Klessig and Victor L. Strite, *The ELF Odyssey: National Security Versus Environmental Protection* (Boulder, CO: Westview Press, 1980).
- 500 (443) *buried six thousand miles of antenna, four to six feet deep*: The ELF antenna grid would have occupied 20,000 of Wisconsin’s roughly 65,000 square miles. See Klessing and Strite, *ELF Odyssay*, p.14 500 (443) *the “continuity of government”*: For a brief description of the new programs, spearheaded in part by Colonel Oliver North, see Thomas C. Reed, *At the Abyss: An Insider’s History of the Cold War* (New York: Ballantine Books, 2004), pp. 245–46.
- 500 (443) *Desmond Ball, an Australian academic, made a strong case*: See Desmond Ball, “Can Nuclear War Be Controlled?,” Adelphi Paper #169, International Institute for Strategic Studies, 1981.
- 500 (443) *John D. Steinbruner ... reached much the same conclusion*: See Steinbruner, “Nuclear Decapitation.” 501 (443) *Bruce G. Blair, a former Minuteman officer*: See Blair, *Strategic Command and Control: Redefining the Nuclear Threat*.
- 501 (443) *Paul Bracken, a management expert*: See Paul Bracken, *The Command and Control of Nuclear Forces* (New Haven, CT: Yale University Press, 1983).
- 501 (443) *Daniel Ford, a former head of the Union of Concerned Scientists*: See Daniel Ford, *The Button: The Pentagon’s Strategic Command and Control System – Does It Work?* (New York: Simon & Schuster, 1985) 443 “*within bazooka range*”: For the quote by a security expert, see *The Button*, p. 64.
- 501 (443) “*within bazooka range*”: For the quote by a security expert, see Ford, *The Button*, p. 64.
- 501 (444) “*its low accuracy and its accident-proneness*”: See “Strategic Force Modernization Programs,” p. 59.
- 501 (444) *on alerts for five months after his first contact with the Soviet embassy*: See Richard Halloran, “Officer Reportedly Kept Job Despite Contact with Soviet,” *New York Times*, June 4, 1981.

- 501 (444) *a major security breach*: Quoted in George Lardner, Jr., “Officer Says Cooke Up Lived Up to Immunity Agreement Terms,” *Washington Post*, September 9, 1981. In a legal case full of bizarre details, Cooke made a deal with the Air Force, confessed to the espionage, and received immunity from prosecution. At the time, the Air Force was more concerned about the possible existence of an Soviet spy ring than about the need to imprison this one young officer. But when it became clear that there was no Soviet spy ring and that Cooke acted alone, the Air Force decided to prosecute him anyway. All of the charges against Cooke were subsequently dismissed by the U.S. Court of Military Appeals on the ground of “prosecutorial misconduct”. See George Lardner, Jr., “Military Kills Lt. Cooke Case,” *Washington*, February 23, 1982, and “A Bargain Explained,” *Washington Post*, February 27, 1982.
- 501 (444) *Funding would not be provided for a new vapor detection system*: See “Item 010: Toxic Vapor Sensors (Fixed and Portable)” in “Titan II Action Item Status Reports,” Headquarters, Strategic Air Command, August 1, 1982.
- 502 (444) *additional video cameras within the complex*: The Air Force decided that the estimated \$18 million cost of adding more cameras did “not justify the marginal benefits.” See “Item 0134: L/D TV Camera,” in *ibid*.
- 502 (444) *“modern nuclear safety criteria for abnormal environments”*: The need to put “modern safety features” inside W-53 warheads had to be balanced against the cost: about \$21.4 million for the remaining fifty-two Titan II missiles. Many of the missiles would be decommissioned before the work could be completed. And so none of the warheads were modified. They remained atop Titan II missiles for another six years. See “Item 090: Modify W-53,” in *ibid*.
- 502 (445) *“It’s the dirt that does it”*: Quoted in Ronald L. Soble, “Cranston Demands Official Justify View That U.S. Could Survive a Nuclear War,” *Los Angeles Times*, January 22, 1982.
- 502 (445) *membership in the Campaign for Nuclear Disarmament soon increased tenfold*: Cited in Lawrence S. Wittner, *Toward Nuclear Abolition: A History of the World Disarmament Movement, 1971 to the Present* (Stanford: Stanford University Press, 2003), p. 131. Wittner is the foremost historian of the international effort to eliminate nuclear weapons.

- 502 (445) *A quarter of a million CND supporters*: Cited in Leonard Downie, Jr., “Thousands in London Protest Nuclear Arms,” *Washington Post*, October 25, 1981.
- 503 (445) *In Bonn, a demonstration ... also attracted a quarter of a million people*: Cited in John Vinocur, “250,000 at Bonn Rally Assail U.S. Arms Policy,” *New York Times*, October 11, 1981.
- 503 (445) “*On the one hand, we returned to business as usual*”: Jonathan Schell, *The Fate of the Earth and The Abolition* (Stanford: Stanford University Press, 2000), p. 149.
- 503 (445) *Carl Sagan conjured an even worse environmental disaster*: Sagan became concerned about the atmospheric effects of nuclear war in 1982, and it seems almost quaint today—as global warming looms as a pending threat—that a generation ago Americans worried that the world might get dangerously cold. But the threat of a nuclear winter never went away. And recent calculations suggest that the detonation of fifty atomic bombs in urban areas would produce enough black carbon smoke to cause another “Little Ice Age.” For the summation of Sagan’s work on the issue, see Carl Sagan and Richard Turco, *A Path Where No Man Thought: Nuclear Winter and the End of the Arms Race* (New York: Random House, 1990). For the latest findings on the global environmental impact of a nuclear war, see Alan Robock, “Nuclear Winter Is a Real and Present Danger,” *Nature*, vol. 473 (May 19, 2011).
- 503 (446) *perhaps three quarters of a million people gathered in New York’s Central Park*: The estimates of the crowd varied, from more than 550,000 to about 750,000. See Paul L. Montgomery, “Throngs Fill Manhattan to Protest Nuclear Weapons,” *New York Times*, June 13, 1982; and John J. Goldman and Doyle McManus, “Largest Ever U.S. Rally Protests Nuclear Arms,” *Los Angeles Times*, June 13, 1982.
- 503 (446) “*the largest political demonstration in American history*”: See Judith Miller, “Democrats Seize Weapons Freeze as Issue for Fall,” *New York Times*, June 20, 1982.
- 504 (446) *orchestrated by “KGB leaders” and “Marxist leaning 60’s leftouts”*: Quoted in Wittner, *Toward Nuclear Abolition*, p. 189.
- 504 (446) *about 70 percent ... supported a nuclear freeze*: *Ibid.*, p. 177.

- 504 (446) *more than half worried*: Cited in Frances FitzGerald, *Way Out There in the Blue: Reagan, Star Wars, and the End of the Cold War* (New York: Touchstone, 2001), p. 191.
- 504 (446) *one of the most dangerous years of the Cold War*: In *The Dead Hand: The Untold Story of the Cold War Arms Race and Its Dangerous Legacy* (New York: Doubleday, 2009), David E. Hoffman does a masterful job of conveying the threat that year, as an aging, paranoid Soviet leader faced a self-confident and seemingly bellicose American president. The events of 1983 are depicted in pages 54 to 100. Robert M. Gates offers an insider's perspective; he was the deputy director for intelligence at the CIA that year. See "1983: The Most Dangerous Year," a chapter in *From the Shadows*, pp. 258–77.
- 504 (446) *code-named Operation RYAN*: For another perspective on the events of 1983 and the KGB's role in them, see Benjamin B. Fischer, "A Cold War Conundrum: The 1983 Soviet War Scare", Central Intelligence Agency, Center for the Study of Intelligence, 1997.
- 504 (446) *the Reagan administration's top secret psychological warfare program*: See "Cold War Conundrum;" and Peter Schweizer, *Victory: The Secret Strategy That Hastened the Collapse of the Soviet Union* (New York: Atlantic Monthly Press, 1994). As Fischer notes, *Victory* may not provide a convincing explanation for why the Soviet Union collapsed, but the book seems to give an accurate description of the Reagan administration's covert activities against the Soviets.
- 504 (447) *"the focus of evil in the modern world"*: Quoted in Francis X. Clines, "Reagan Denounces Ideology of Soviet as 'Focus of Evil,'" *New York Times*, March 9, 1983.
- 505 (447) *"Engaging in this is not just irresponsible"*: Quoted in Fischer "Cold War Conundrum".
- 505 (447) *"an act of barbarism" and a "crime against humanity"*: Quoted in Flora Lewis, "Leashing His Fury, Reagan Surprises and Calms Allies," *New York Times*, September 11, 1983.
- 504 (447) *alarms went off in an air defense bunker south of Moscow*: See Hoffman, *Dead Hand*, pp. 6–11.

- 508 (447) *rays of sunlight reflected off clouds*: See David Hoffman, “‘I Had a Funny Feeling in My Gut’; Soviet Officer Faced Nuclear Armageddon,” *Washington Post*, February 10, 1999.
- 508 (448) *two million people in Europe joined protests*: Cited in Joseph B. Fleming, “Anti-Missile Movement Vows to Fight On,” *United Press International*, October 23, 1983.
- 506 (448) *serious problems with the World Wide Military Command and Control System*: See Pearson, *WWMCCS: Evolution and Effectiveness*, pp. 315-17; and “JTF Operations Since 1983,” George Stewart, Scott M. Fabbri, and Adam B. Siegel, CRM 94-42, Center for Naval Analyses, July 1994, pp. 23-31.
- 506 (448) *“a frustrated Army officer used his AT&T credit card”*: “JTF Operations Since 1983,” p. 28.
- 506 (448) *Able Archer 83*: See Gates, *From the Shadows*, pp. 270-73; Hoffman, *Dead Hand*, pp. 94-95; Fischer, “Cold War Conundrum”.
- 506 (448) *“the KGB concluded that American forces”*: The agent was Oleg Gordievsky. He worked not only for the KGB but also for British intelligence. His quote is from Fischer, “Cold War Conundrum”.
- 507 (448) *A number of the Soviet Union’s own war plans*: See Hoffman, *Dead Hand*, p. 94.
- 507 (449) *About 100 million Americans watched The Day After*: Cited in Robert D. McFadden, “Atomic War Film Spurs Nationwide Discussion,” *New York Times*, November 22, 1983.
- 508 (449) *another B-52 had caught on fire on a runway*: See Phyllis Mensing, “5 Die in B-52 Fire at Air Base,” Associated Press, January 27, 1983.
- 508 (450) *the retrofits were halted ... because the program ran out of money*: Peurifoy interview.
- 508 (450) *“The worst probable consequence of continuous degradation”*: “‘Hot’ Topic!, Nuclear AID [Accidents, Incidents, Deficiencies] Topics,” *USAF Nuclear Surety Journal*, no. 90-01, p. 5.
- 508 (450) *“Naturally, this would be a catastrophe”*: Ibid.
- 508 (450) *“follow procedures and give the weapons a little extra care”*: Ibid.
- 509 (450) *A software glitch could launch a Pershing II missile*: Peurifoy and Stevens interviews. See also Stevens, “Origins and Evolution of S2C”, pp. 116-18.



- 509 (451) *Reagan watched red dots spreading across a map*: See Reed, *At the Abyss*, pp. 233-34.
- 509 (451) *Reagan's belief in the plan was sincere*: Two well-researched books argue persuasively that Reagan hoped to protect the United States from a nuclear attack and rid the world of nuclear weapons. The books suggest that Reagan's tough Cold War rhetoric hid a warmer, more peace-loving side. And yet both books fail to place Reagan's subsequent arms control efforts in a wider political context. The massive antinuclear demonstrations in the United States and Western Europe are mentioned on only three of the roughly eight hundred pages in these books—and with disparagement. On October 5, 1982, President Reagan said that the nuclear freeze movement was “inspired ... by people who want the weakening of America.” The huge demonstrations that soon followed no doubt influenced his subsequent behavior, as did his wife Nancy, who strongly supported arms control talks. Reagan's transformation into an outspoken nuclear abolitionist, though heartfelt, followed—and did not lead—American public opinion. Although written without access to many declassified documents, Frances FitzGerald's *Way Out There in the Blue* has a broader perspective. See Lettow, *Ronald Reagan and His Quest to Abolish Nuclear Weapons*; Martin Anderson and Annelise Anderson, *Reagan's Secret War: The Untold Story of His Fight to Save the World from Nuclear Disaster* (New York: Crown, 2009); and Rich Jaroslovsky, “Reagan Blasts Nuclear Freeze Movement, Saying Some Seek ‘Weakening of America,’” *Wall Street Journal*, October 5, 1982.
- 510 (451) *“impotent and obsolete”*: “President's Speech on Military Spending and a New Defense,” *New York Times*, January 27, 1983.
- 510 (451) *The Day After left even him feeling depressed*: Thomas Reed, one of Reagan's national security advisers, thought the film “understated ... the horrors of nuclear war.” See Reed, *At the Abyss*, pp. 250, 255.
- 510 (451) *“A nuclear war cannot be won”*: “Transcript of Statement by President,” *New York Times*, April 18, 1982.
- 511 (452) *“The President agreed this could be sorted out”*: “Memorandum of Conversation, Hofdi House, Reykjavik, 3:25 – 6:00, October 12, 1986, United States Department of State (secret/sensitive/ declassified), p. 9, in

- George P. Shultz and Sidney D. Drell, *Implications of the Reykjavik Summit on Its Twentieth Anniversary* (Stanford: Hoover Institution Press, 2007), p. 210.
- 511 (452) *The euphoria ... didn't last long*: See Ibid., pp. 211-15.
- 511 (453) *almost half of the weapons in the American stockpile*: Peurifoy interview.
- 512 (454) *Peurifoy wrote to the assistant secretary for defense programs*: A more detailed account of the bureaucratic inertia can be found in Stevens, "Origins and Evolution of S2C," pp. 162-66.
- 513 (454) *"The potential for a nuclear weapon accident"*: Quoted in *ibid.*, p. 164.
- 513 (455) *The Post ran a series of his articles*: See R. Jeffrey Smith, "Defective Nuclear Shells Raise Safety Concerns; U.S. Secretly Repairing Weapons in Europe," *Washington Post*, May 23, 1990; "Pentagon Urged to Ground Nuclear Missile for Safety," *Washington Post*, May 24, 1990; "Pentagon to Await Missile Safety Study; Weapons Will Remain on 'Alert' Bombers," *Washington Post*, May 25, 1990.
- 514 (455) *"weapon meets all our current safety standards"*: Quoted in "Pentagon to Await Missile Safety Study." 514 (455) *"no safety hazards to the public"*: Quoted in R. Jeffrey Smith, "A-Missiles Ordered Off Planes; Weapons Grounded Pending Completion of Safety Review," *Washington Post*, June 9, 1990.
- 515 (456) *The Drell Panel on Nuclear Weapons Safety*: "Report of the Panel on Nuclear Weapons Safety of the Committee on Armed Services, House of Representatives, One Hundred First Congress, Second Session," Sidney D. Drell, Chairman, John S. Foster, Jr., and Charles H. Townes, December 1990. For Drell's testimony and a discussion of the panel's findings, see "The Report of the Nuclear Weapons Safety Panel," Hearing Before the Committee on Armed Services, House of Representatives, 101st Congress, Second Session, December 18, 1990.
- 515 (456) *"a realization that unintended nuclear detonations"*: The panel singled out the SRAM as the cause of "greatest concern," warning a fire could cause "the potential for dispersal of plutonium, or even of the generation of a nuclear detonation." "Report of the Panel on Nuclear Weapons Safety," p. 25.
- 515 (456) *"affirm enhanced safety as the top priority"*: Ibid., p. 33.

- 515 (456) *A separate study on nuclear weapon safety*: “Report to the Congress: Assessment of the Safety of U.S. Nuclear Weapons and Related Nuclear Test Requirements,” R. E. Kidder, Lawrence Livermore National Laboratory, July 26, 1991.
- 515 (456) *Three weapons received an A*: Ibid., p. 4.
- 515 (456) *General Colin Powell and Secretary of Defense Dick Cheney*: For the decision to change the SIOP and reduce the number of targets in the Soviet Union, see Colin Powell with Joseph E. Persico, *My American Journey* (New York: Ballantine Books, 1996), pp. 540–41; and Reed, *At the Abyss*, pp. 278–84, 287–92.
- 516 (457) *Hundreds of nuclear warheads would hit Moscow*: Cited in Reed, *At the Abyss*, p. 283.
- 516 (457) “*With the possible exception of the Soviet nuclear war plan*”: “Speech to the Canadian Network Against Nuclear Weapons,” George Lee Butler, Montreal, March 11, 1999.
- 516 (457) *Butler eliminated about 75 percent of the targets*: Cited in R. Jeffrey Smith, “Retired Nuclear Warrior Sounds Alarms on Weapons,” *Washington Post*, December 4, 1996.
- 516 (457) *National Strategic Response Plans*: See “Memorandum for the Chairman, Joint Chiefs of Staff, From General George L. Butler, Commander in Chief, United States Strategic Command, Subject: Renaming the Single Integrated Operational Plan (SIOP),” September 2, 1992, (confidential/declassified). This document was obtained through the Freedom of Information Act by Hans M. Kristensen, director of the Nuclear Information Project at the Federation of American Scientists.
- 516 (457) “*State Committee for the State of Emergency*”: For the attempted coup, see William E. Odom, *The Collapse of the Soviet Military* (New Haven: Yale University Press, 1998), pp. 305–46; Hoffman, *Dead Hand*, pp. 369–76; and Mikhail Tsypkin, “Adventures of the ‘Nuclear Briefcase’: A Russian Document Analysis,” *Strategic Insights*, Center for Contemporary Conflict, Naval Postgraduate School, vol. 3, issue 9 (2004).
- 517 (458) *President George H. W. Bush announced a month later*: See “Remarks by President Bush on Reducing U.S. and Soviet Nuclear Weapons,” *New York Times*, September 28, 1991.

- 518 (459) *"The long bitter years of the Cold War are over"*: Quoted in Steve Kline, "SAC, America's Nuclear Strike Force, Is Retired," *Associated Press*, June 2, 1992.

## EPILOG

- 519 (460) *hidden by a repair tag*: Charles Perrow's succinct, unsettling account of the mishap at Three Mile Island can be found in his book, *Normal Accidents: Living with High-Risk Technologies* (Princeton: Princeton University Press, 1999), pp. 15-31.
- 519 (460) *his shirt caught on the handle of a circuit breaker*: Ibid., pp. 43-44.
- 519 (460) *A lightbulb slipped out of the hand*: Ibid.
- 519 (460) *"trivial events in nontrivial systems"*: Ibid., pp. 43-46.
- 519 (460) *"Our ability to organize"*: Ibid., p. 10.
- 520 (461) *"tightly coupled"*: Ibid., pp. 89-100.
- 520 (461) *"No one dreamed that when X failed"*: Ibid., p. 4.
- 520 (461) *"those closest to the system, the operators"*: Ibid., p. 10.
- 520 (461) *"Time and time again, warnings are ignored"*: Ibid.
- 521 (462) *"the highest state of readiness for nuclear war"*: Sagan, *The Limits of Safety*, p. 62.
- 521 (462) *an Atlas long-range missile was test-launched*: ibid., pp. 78-80.
- 521 (462) *"so loose, it jars your imagination"*: Quoted in ibid., p. 110.
- 521 (462) *"In retrospect," Melgard said*: Quoted Ibid.
- 521 (462) *one of the most dangerous incidents*: Ibid., pp. 135-38.
- 521 (463) *"numerous dangerous incidents ... occurred"*: Ibid., p. 251.
- 521 (463) *"a stabilizing force"*: Ibid.
- 522 (463) *"Nuclear weapons may well have made deliberate war"*: Ibid., p. 264.
- 522 (463) *less by "good design than good fortune"*: Ibid., p. 266.
- 523 (464) *"Fixes, including safety devices"*: Perrow, *Normal Accidents*, p. 11.
- 523 (464) *"Do Artifacts Have Politics?"*: The essay can be found in Langdon Winner, *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (Chicago: University of Chicago Press, 1989), pp. 19-39.
- 524 (464) *"As long as it exists at all"*: Ibid., p. 34.

- 524 (465) *“born secret”*: The Atomic Energy Act of 1946 required that “all data concerning the manufacture or utilization of atomic weapons” must be classified, and it created a new legal category for such information: Restricted Data. An amendment to the act in 1954 added another category of secret knowledge—Formerly Restricted Data—that pertains mainly to the military uses, capabilities, and deployments of nuclear weapons. Despite the apparent meaning of that name, Formerly Restricted Data is still classified information that can’t be released to the public without permission from the Department of Energy and the Department of Defense. For insight into the Orwellian world of nuclear secrecy, see Howard Morland, “Born Secret,” *Cardozo Law Review*, vol. 26, no. 4 (March 2005), pp. 1401–8; “Restricted Data Declassification Decisions, 1946 to the Present,” RDD-8, U.S. Department of Energy, Office of Health, Safety and Security, Office of Classification, January 1, 2002 (official use only/declassified); and “Transforming the Security Classification System,” Report to the President from the Public Interest Declassification Board, November 2012.
- 524 (465) *“Accidents and Incidents Involving Nuclear Weapons”*: The document, cited previously, is “Accidents and Incidents Involving Nuclear Weapons: Accidents and Incidents During the Period 1 July 1957 Through 31 March 1967,” Technical Letter 20-3, Defense Atomic Support Agency, October 15, 1967 (secret/restricted data/declassified).
- 525 (465) *a Genie antiaircraft missile released from a fighter*: Ibid., Incident #33, p. 14.
- 525 (465) *a Boar missile crushed by the elevator*: Ibid., Incident #3, p. 53.
- 525 (465) *a Mark 49 warhead blown off a Jupiter missile*: Ibid., Incident #11, p. 34.
- 525 (465) *smoke pouring from a W-31 warhead atop a Nike missile*: Ibid., Incident #51, p. 89.
- 525 (465) *the retrorockets of a Thor missile suddenly firing*: The launch pad was evacuated, and when technicians returned to the site they found that the “latch safety pins” were still holding the reentry vehicle atop the missile. “The cause of the incident,” the report concluded, “was failure to follow prescribed safety rules for the Thor missile.” See Ibid., Incident #42, p. 87.
- 525 (465) *a Mark 28 bomb emitting strange sounds*: Ibid., Incident #9, p. 72.

- 525 (465–66) *the John Walker spy ring ... provided about a million documents*: See Pete Earley, *Family of Spies: Inside the John Walker Spy Ring* (New York: Bantam, 1988), p. 358.
- 525 (466) *so secret that the president ... wasn't allowed to know it*: Known as the “Venona decryptions,” they helped to discover the names or code names of about two hundred Americans spying for the Soviet Union. The chairman of the Joint Chiefs of Staff, General Omar Bradley, made the decision not to tell President Truman. The motive was less sinister than bureaucratic. “Here we have government secrecy in its essence,” Senator Daniel Patrick Moynihan later wrote. “Departments and agencies hoard information, and the government becomes a kind of market.” Those who know the secrets have great influence over that market. For the decision to keep Truman in the dark, see Daniel Patrick Moynihan, *Secrecy: The American Experience* (New Haven, Yale University Press, 1998), pp. 59–73. The quote appears on page 73.
- 525 (466) *But the Soviet Union learned the secret*: See *Ibid.*, p. 16; and James Earl Haynes and Harvey Klehr, *Venona: Decoding Soviet Espionage in America* (New Haven: Yale University Press, 2000), pp. 47–56.
- 525 (466) *“Secrecy is a form of government regulation”*: See *Secrecy: Report of the Commission on Protecting and Reducing Government Secrecy* (Washington, D.C.: Government Printing Office, 1997). Quoted in Moynihan, *Secrecy*, p. 12.
- 526 (466) *Cold War documents that were declassified in the 1990s*: See Scott Shane, “U.S. Reclassifies Many Documents in Secret Review,” *New York Times*, February 21, 2006.
- 526 (467) *Chelyabinsk-65, the site of a nuclear weapon facility*: For the tragic legacy of Soviet weapon production, see Vladislav Larin, “Mayak’s Walking Wounded,” *Bulletin of the Atomic Scientists* (September/October 1999), pp. 20–27, and John M. Whitely, “The Compelling Realities of Mayak,” in Russell J. Dalton, Paula Garb, Nicholas P. Lovrich, John C. Pierce, and John M. Whiteley, eds., *Critical Masses: Citizens, Nuclear Weapons Production, and Environmental Destruction in the United States and Russia* (Cambridge, MA: MIT Press, 1999), pp. 59–96.

- 526 (467) *“arguably the most polluted spot on the planet”*: Quoted in Dalton et al., *Critical Masses*, p. 67.
- 527 (467) *well suited to the demands of nuclear command and control*: Bruce G. Blair has written the best guide to the Soviet system. His work on the subject can be found in *The Logic of Accidental Nuclear War* (Washington, D.C.: Brookings Institution, 1993), pp. 59–167, and *Global Zero Alert for Nuclear Forces* (Washington, D.C.: Brookings Institution, 1995). Blair also wrote the introduction for one of the few works in the field written by a Russian expert: Valery E. Yarynich, *C 3: Nuclear Command, Control Cooperation* (Washington, D.C.: Center for Defense Information, 2003). Two other sources, although dated, contain much fascinating information. See Stephen M. Meyer, “Soviet Nuclear Operations,” in Ashton Carter, John D. Steinbruner, and Charles A. Zraket, eds., *Managing Nuclear Operations* (Washington, D.C.: Brookings Institution, 1987); and Stephen I. Cimbala, *Soviet C3*, (Washington D.C.: AFECA International Press 1987).
- 527 (467) *“more stringent than those of any other nuclear power”*: Blair, *The Logic of Accidental Nuclear War*, p. 107.
- 527 (467) *the “Perimeter” system*: See Blair, *Global Zero Alert*, pp. 51–56; Yarynich, *C 3*, pp. 137–45, 157–59, 245–48; and Hoffman, *Dead Hand*, pp. 152–54, 421–23.
- 528 (468) *Sidney Drell regards Bob Peurifoy as one of the leading*: Interview with Sidney Drell.
- 528 (469) *the nuclear weapon community ... became outspoken in defense of his cause*: For a good analysis of the sudden interest in nuclear weapon safety, see Frank von Hippel, “Test Ban Debate, Round Three: Warhead Safety,” *Bulletin of the Atomic Scientists*, April 1991.
- 529 (469) *During a Senate debate on the treaty in August 1992*: The senators were discussing an amendment to an energy and water development bill. See “Amendment No. 2833, Energy and Water Development Appropriations Act,” Senate, August 3, 1992, Congressional Record, 102nd Congress (1991–1992), pp. S11171-S11222.
- 529 (469) *“Why is testing of nuclear weapons so important?”*: Ibid., p. S11172. The senator was J. Bennett Johnston, Jr., a Democrat from Louisiana.

- 529 (469) *“we already know that science and technology cries out”*: Ibid., p. S11184. The senator was Pete Domineci, a Republican from New Mexico.
- 529 (469) *“A vote to halt nuclear testing today”*: Ibid., pp. S11186-S11187. The senator was William Cohen, a Republican from Maine.
- 530 (469) *the treaty’s opponents argued that nuclear tests*: See Eric Schmitt, “Experts Say Test Ban Could Impair Nuclear-Arms Safety,” *New York Times*, October 8, 1999. The National Academy of Sciences recently issued a report contradicting that argument. See *The Comprehensive Nuclear Test Ban Treaty—Technical Issues for the United States*, Committee on Reviewing and Updating Technical Issues Related to the Comprehensive Nuclear Test Ban Treaty, National Research Council of the National Academies (Washington, D.C.: National Academies Press, 2012).
- 530 (470) *the first “green” nuclear weapon*: A 2007 report claimed that the Reliable Replacement Warhead (RRW) would be “much more than ‘just green.’” The new weapon would reduce “potential harm to the environment and ... improve worker safety.” Despite those lofty aims, President Obama eliminated funding for the RRW in 2009. See “Nuclear Warheads: The Reliable Replacement Warhead Program and the Life Extension Program,” Jonathan Medalia, CRS Report for Congress, Congressional Research Service, December 3, 2007, p. 20.
- 530 (470) *“a money grab”*: Peurifoy interview.
- 530 (470) *a study by JASON scientists*: See “Pit Lifetime,” JSR-06-335, MITRE Corporation, January 11, 2007.
- 530 (470) *“nonsense”*: Agnew interview.
- 531 (470) *The Drell panel expressed concern about these warheads*: “The safety issue,” it said, “is whether an accident during handling of an operational missile ... might detonate the propellant which in turn could cause the [high explosives] in the warhead to detonate leading to dispersal of plutonium, or even the initiation of a nuclear yield beyond the four-pound criterion.” See “Report of the Panel on Nuclear Weapons Safety,” pp. 26–30. The quote can be found on page 29. For a more detailed look at the problem, see John R. Harvey and Stefan Michalowski, “Nuclear Weapons Safety: The Case of Trident,” *Science and Global Security*, Vol. 4 (1994), pp. 261–337.
- 531 (471) *decrease the missile’s range by perhaps 4 percent*: Peurifoy interview.



- 532 (471–72) *General Wilbur L. Creech had the same sort of lasting influence:* See James C. Slife, *Creech Blue: General Bill Creech and the Reformation of the Tactical Air Forces, 1978–1984* (Maxwell Air Force Base, AL: Air University Press and the College of Aerospace Doctrine, Research and Education, 2004).
- 532 (472) *1,737 Air Force planes were shot down:* See John T. Correll, “The Air Force in the Vietnam War,” Air Force Association, December 2004, p. 26.
- 532 (472) *the United States has lost fewer than thirty planes:* This is my own estimate. The Air Force declined to provide me with a list of combat losses since 2003. “USAF Manned Aircraft Losses 1990–2002,” compiled by the Air Force Historical Research Agency, mentions seventeen fixed-wing aircraft shot down during that period—three in missions over the former Yugoslavia and fourteen in Operation Desert Storm. An additional three planes were shot down between 2003 and the fall of 2008, according to “Cost in Airframes,” by Michael C. Sirak, *Air Force Magazine*, October 27, 2008. After looking through the United States Air Force Class A Aerospace Mishap Reports for the years 2009 through 2012, I could not find another case of a manned, fixed-wing aircraft brought down by enemy fire. Perhaps a number of the crashes listed were, in fact, combat-related. Nevertheless, the Air Force’s achievement is remarkable, given that its pilots had flown more than half a million sorties over Iraq and Afghanistan by the spring of 2008. That statistic comes from a chart in Tamar A. Mehuron and Heather Lewis, “The Mega Force,” *Air Force Magazine*, June 2008.
- 533 (472) *units were now given seventy-two hours of warning:* The meaning of the words “no-notice” had clearly evolved over the years. According to a 2008 investigation of how the Air Force was managing its nuclear arsenal, “so-called ‘no-notice’ inspections do not begin until 72 hours after the unit is notified.” The investigation was headed by former Secretary of Defense James Schlesinger. See “Report of the Secretary of Defense Task Force on DoD Nuclear Weapons Management, Phase I: The Air Force’s Nuclear Mission,” September 2008, p. 37.
- 533 (472) *a captain or a colonel became the highest-ranking officer:* Ibid., p. 27. According to a study of how the Air Force mistakenly shipped secret nuclear warhead fuzes to Taiwan instead of helicopter batteries, these

- officers were sometimes not only low ranked but unqualified for their jobs. “There are some leaders with little, dated, or no nuclear experience,” the study found, “who hold leadership positions in the Air Force nuclear enterprise.” That study is quoted in “The Unauthorized Movement of Nuclear Weapons and Mistaken Shipment of Classified Missile Components: An Assessment,” Michelle Spencer, Aadina Ludin, and Heather Nelson, USAF Counterproliferation Center, January 2012, p. 86.
- 533 (472) *half of the Air Force units responsible for nuclear weapons failed*: Cited in Joby Warrick and Walter Pincus, “Missteps in the Bunker,” *Washington Post*, September 23, 2007.
- 533 (472) *the nose-cone fuze assemblies of four Minuteman III missiles*: See Sponcer et al. “Unauthorized Movement and Mistaken Shipment,” pp. 13–14.
- 533 (472) *On August 29, 2007, six cruise missiles armed with nuclear warheads were mistakenly loaded*: The warheads were loaded on August 29 and discovered the following day. For the official account of the incident, see “Report on the Unauthorized Movement of Nuclear Weapons,” the Defense Science Board Permanent Task Force on Nuclear Weapons Surety, Department of Defense, Washington D.C., February 2008. For a borad look at the management failures that lead to the warheads being left unattended, see “The Unauthorized Shipment of Nucear Weapons and mistaken Shipment of Calssified Missile Components: An Assessment,” Michelle Spencer, A. Ludin, H. Nelson, The Counterproliferation Papers, Future-Warefare-Series No. 56, USAF Counterproliferation Center, January 2012. Joby Warrick and Walter Pincus wrote a fine piece about the incident: “Missteps in the Bunker,” *Washington Post*, September 23, 2007. And Rachel Maddow includes some disturbing details about it in her book *Drift: The Unmooring of American Military Power* (New York: Crown Publishers, 2012), pp. 231–38.
- 534 (473) “*significant confusion about delegation of responsibility*”: “Report on the Unauthorized Movement,” p. 5. The confusion was widespread. Neither the aircraft crew chief nor the pilot of the B-52 had been trained to handle nuclear weapons. And investigators found that the six nuclear weapons were “driven past a security checkpoint ... but no one checked them as they

passed.” The quote comes from Spencer et al., “Unauthorized Movement and Mistaken Shipment,” p. 12.

534 (473) *nobody was ever asked to sign a piece of paper:* “In the past, there was a requirement for a formal change of custody, physically verified by serial numbers, recorded, and signed on a formal document when weapons moved from breakout crew to convoy crew to crew chief to air crew,” the Defense Science Board noted. But at some point those procedures were discontinued—and the movement of nuclear weapons out of the igloo no longer had to be recorded. “Report on the Unauthorized Movement,” p. 5.

534 (473) *A maintenance team arrived at a Minuteman III silo:* For the details of this incident, see “United States Air Force Missile Accident Investigation Board Report,” Minuteman III Launch Facility A06, 319th Missile Squadron, 90th Operations Group, 90th Missile Wing, F. E. Warren Air Force Base, Wyoming, May 23, 2008, “Robert M. Walker, President, Accident Investigation Board, September 18, 2008.

534 (474) *The fire was most likely caused:* Ibid., p. 4.

534 (474) *it may have occurred five days before the maintenance team noticed:* Ibid.

534 (474) *“unique identifiers” for its nuclear weapons:* The Department of Defense is attempting, with varying degrees of success, to keep track of its vast inventory of weapons, parts, and equipment with “Item Unique Identification” (IUID) technology—the sort of bar codes that supermarkets and electronics stores have used for years. “In the area of Nuclear Weapon Related Material (NWRM),” the head of the Air Force Nuclear Weapons Center testified in 2010, “we continue to gain and refine Positive Inventory Control.” The general promised to “lock down all NWRM through unique identifiers and supply chain discipline” but warned “there will be occasional discoveries of newly uncovered assets for years to come.” Presumably the weapons themselves are now being scanned, tracked, and stored in the right place. See “Defense Logistics: Improvements Needed to Enhance DOD’s Management Approach and Implementation of Item Unique Identification Technology,” United States Government Accountability Office, Report to the Subcommittee on Readiness, Committee on Armed Services, House of Representatives, May 2012; and “Status of the Air Force Nuclear Security Roadmap,” Brigadier General Everett H. Thomas, Commander, Air Force

- Nuclear Weapons Center, Presentation to the Strategic Forces Subcommittee, Armed Service Committee House of Representatives one Hundred and Eleventh Congress, January 21, 2010, pp. 5, 6.
- 535 (474) *Each of its twenty B-2 bombers costs \$2 billion:* Cited in Tim Weiner, “The \$2 Billion Bomber Can’t Go Out in the Rain,” *New York Times*, August 23, 1997.
- 535 (474) *And its B-52 bombers haven’t been manufactured since:* The last B-52 was made in 1962, and it’s still flying. See John Andrew Prime, “B-52 Bomber Marks Major Milestones in 2012,” *Air Force Times*, April 9, 2012.
- 535 (474) *The B-52s are scheduled to remain in service:* See David Majumdar, “Upgrades to Keep B-52s Flying Through 2040,” *Air Force Times*, October 4, 2011.
- 535 (474) *Its mainframe computers had become hopelessly out of date:* The WWMCCS had never worked well. A 1979 study found that its automated data processing program was “not responsive” to local or national needs, “not reliable,” and “cannot transfer data ... efficiently.” Other than that, it was a terrific system. The advent of digital communications spelled the end of the WWMCCS. See “The World Wide Military Command and Control System—Major Changes Needed in Its Automated Data Processing Management and Direction,” Comptroller General of the United States, Report to the Congress, December 14, 1979, p. ii.
- 535 (474) *the Global Command and Control System:* See “Global Command and Control System Adopted,” news release, United States Department of Defense, No. 552-96, September 26, 1996.
- 535 (474–75) *Known by the acronym DIRECT:* See “General Dynamics Awarded \$1M DIRECT Emergency Action Message System Support Contract,” PR Newswire, May 23, 2001; and “DIRECT Messaging System Overview,” General Dynamics C4 Systems (n.d.).
- 536 (475) *a computer failure at F. E. Warren Air Force Base:* For details of the incident, see David S. Cloud, “Pentagon Cites Hardware Glitch in ICBM Outage,” *Los Angeles Times*, October 27, 2010, and Michelle Tan, “Equipment Failure Cited in Warren Incident,” *Air Force Times*, May 5, 2011.

- 536 (475) *a report by the Defense Science Board warned*: See “Resilient Military Systems and the Advanced Cyber Threat,” Task Force Report, Defense Science Board, Department of Defense, January 2013, pp. 7, 42, 85.
- 536 (475) *no “significant vulnerability”*: See “Hearing to Receive Testimony on U.S. Strategic Command and U.S. Cyber Command in Review of the Defense Authorization Request for Fiscal Year 2014 and the Future Years Defense Program,” Committee on Armed Services, United States Senator, One Hundred and Thirteenth Congress, March 12, 2013, p. 10.
- 536 (475) *an “end-to-end comprehensive review”*: See *ibid.*
- 536 (475) *“Senator, I don’t know”*: See *ibid.*, p. 22.
- 536 (475) *Operation Neptune Spear*: See Mark Bowden, *The Finish: The Killing of Osama Bin Laden* (New York: Atlantic Monthly Press, 2012), pp. 216–64.
- 536 (476) *The 9/11 Commission Report offers a sobering account*: See National Commission on Terrorist Attacks Upon the United States. *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks Upon the United States* (New York: W. W. Norton, 2004), pp. 1–46.
- 537 (476) *an attack ... that lasted about seventy-eight minutes*: The World Trade Center was hit by the first plane at 8:46:40 in the morning; the second plane struck the building at 9:03:11; the Pentagon was hit at 9:37:46; and United Airlines Flight 93 crashed in a field near Shanksville, Pennsylvania, at 10:03:11. Those seventy-seven minutes and thirty-one seconds were an eternity—compared to the amount of time in which America’s command-and-control system was supposed to respond decisively during a Soviet missile attack. For the chronology of that September morning, see *9/11 Commission Report*, pp. 32–3.
- 537 (476) *His calls to the Pentagon and the White House underground bunker were constantly dropped*: *Ibid.*, p. 40.
- 537 (476) *they were ordered into the air by a Secret Service agent*: “The President and the Vice President indicated to us,” the report notes, “they had not been aware that fighters had been scrambled out of Andrews, at the request of the Secret Service and outside the military chain of command.” *Ibid.*, p. 44.
- 537 (476) *the United States has approximately 4,650 nuclear weapons*: These numbers come from Hans Kristensen, director of the Nuclear Information Project at the Federation of American Scientists. Kristensen has for many

- years been a reliable source and an indefatigable researcher on nuclear matters. See Hans M. Kristensen, “Trimming Nuclear Excess: Options for Further Reductions of U.S. and Russian Nuclear Forces,” Federation of American Scientists, Special Report No. 5, December 2012, p. 15.
- 537 (476) *About 300 are assigned to long-range bombers:* Cited in Hans M. Kristensen and Robert S. Norris, “U.S. Nuclear Forces, 2013,” *Bulletin of the Atomic Scientists* (March/April 2013), p. 77.
- 537 (476) *500 are deployed atop Minuteman III missiles:* Cited in *ibid.*
- 537 (476) *1,150 are carried by Trident submarines:* Cited in *ibid.*
- 537 (476) *An additional 200 or so hydrogen bombs:* Cited in *ibid.*
- 537 (476) *About 2,500 nuclear weapons are held in reserve:* Cited in *ibid.*
- 537 (476) *now known as the Operations Plan (OPLAN 8010):* For the most detailed investigation of the current OPLAN, see Hans M. Kristensen, “Obama and the Nuclear War Plan,” Federation of the American Scientists Issue Brief, February 2010.
- 538 (476) *“Strategic Deterrence and Global Strike”:* Quoted in *ibid.*, p. 7.
- 538 (477) *Russia, China, North Korea, Syria, and Iran:* *Ibid.*, p. 3.
- 538 (477) *“Adaptive planning”:* *Ibid.*, p. 5.
- 538 (477) *The United States now plans to spend as much as \$180 billion:* See Walter Pincus, “Nuclear Complex Upgrades Related to START Treaty to Cost \$180 Billion,” *Washington Post*, May 14, 2010.
- 538 (477) *Russia has about 1,740 deployed strategic weapons and perhaps 2,000 tactical weapons:* Cited in Kristensen, “Trimming Nuclear Excess,” p. 10.
- 538 (477) *France is adding new aircraft and submarines:* For an overview of the world’s nuclear powers, the size of their arsenals, and their modernization schemes, see Ian Kearns, “Beyond the United Kingdom: Trends in the Other Nuclear Armed States,” Discussion Paper 1 of the BASIC Trident Commission, November 2011. The French weapons program is discussed on page 20.
- 538 (477) *The United Kingdom ... approximately 160 warheads:* An additional sixty-five warheads are kept in storage, for a total of 225. Cited in Richard Norton-Taylor, “Britain’s Nuclear Arsenal is 225 Warheads, Reveals William Hague,” *Guardian* (UK), May 26, 2010.

- 538 (477) *China is thought to have about 240 nuclear weapons*: Cited in Hans M. Kristensen and Robert S. Norris, “Chinese Nuclear Forces, 2011,” *Bulletin of the Atomic Scientists*, November 1, 2011, p. 81. At the moment, there is general agreement that China is increasing the size of its arsenal. But assertions that China has three thousand warheads hidden underground seem unlikely. For China’s traditional policy of minimum deterrence, see M. Taylor Fravel and Evan S. Medeiros, “China’s Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Structure,” *International Security*, vol. 35, no. 2 (Fall 2010), pp. 7–44. For a much different interpretation of its nuclear policies, see Bret Stephens, “How Many Nukes Does China Have?,” *Wall Street Journal*, October 24, 2011.
- 538 (477) *an “underground Great Wall”*: See Setevens, “How many Nukes,” and William Wan, “Georgetown Students Shed Light on China’s Tunnel System for Nuclear Weapons,” *Washington Post*, November 29, 2011.
- 538 (477) *North Korea may already have half a dozen nuclear weapons*: See Mary Beth Nikitin, “North Korea’s Nuclear Weapons: Technical Issues,” CRS Report for Congress, Congressional Research Service, April 3, 2013, p. 4.
- 538 (477) *The yield of North Korea’s first weapon test*: Cited in *ibid.*, p. 15.
- 539 (478) *“It could go off if a rifle bullet hit it”*: Quoted in Sagan, *Limits of Safety*, p. 266. The quote originally appeared in Gary Milhollin, “Building Saddam Hussein’s Bomb,” *New York Times*, March 8, 1992.
- 539 (478) *The ballistic-missile submarines in the Russian fleet*: For the deterioration of Russian strategic forces and the potentially destabilizing effects, see David E. Mosher, Lowell H. Schwartz, David R. Howell, and Lynn E. Davis, *Beyond the Nuclear Shadow: A Phased Approach for Improving Nuclear Safety and U.S.–Russian Relations* (Santa Monica, CA: RAND, 2003).
- 539 (478) *the launch of a small research rocket by Norway*: For the story of this false alarm, which occurred years after the end of the Cold War, see David Hoffman, “Cold War Doctrines Refuse to Die,” *Washington Post*, March 15, 1998.
- 539 (478) *The greatest risk of nuclear war now lies in South Asia*: That is my personal view, and unfortunately, a great deal has been written that supports it. *Inside*

*Nuclear South Asia* (Stanford: Stanford University Press, 2009), edited by Scott D. Sagan, contains two particularly good essays: “Revisionist Ambitions, Conventional Capabilities, and Nuclear Instability: Why Nuclear South Asia Is Not Like Cold War Europe,” by S. Paul Kapur, and “The Evolution of Pakistani and Indian Doctrine,” by Sagan. Another fine book is Feroz Hassan Khan’s *Eating Grass: The Making of the Pakistani Bomb* (Stanford: Stanford Security Series, 2012). Paul Bracken’s *The Second Nuclear Age: Strategy, Danger, and the New Power Politics* (New York: Times Books, 2012) has a provocative chapter on the risk of nuclear war in South Asia. Bracken has been studying the importance of command and control for more than thirty years. The work of a British academic, Shaun Gregory, seems especially relevant at the moment. Before investigating Pakistan’s efforts to maintain its nuclear weapons securely, Gregory wrote a book about nuclear weapons accidents and one about the command and control of NATO forces. I learned much during my conversation with Gregory and from his writing, especially “The Security of Nuclear Weapons in Pakistan,” Pakistan Security Research Unit, Brief Number 22, November 18, 2007; “The Terrorist Threat to Pakistan’s Nuclear Weapons,” *CTC Sentinel*, Combating Terrorism Center at West Point, July 2009, pp. 1–4; and “Terrorist Tactics in Pakistan Threaten Nuclear Weapons Safety,” *CTC Sentinel*, Combating Terrorism Center at West Point, June 2011, pp. 4–7.

- 540 (479) *Pakistan has doubled the size of its arsenal since 2006*: Cited in Bracken, *The Second Nuclear Age*, p. 162.
- 540 (479) *It now has about 100 nuclear weapons*: Estimates range from 90 to 110. Cited in Paul K. Kerr and Mary Beth Nikitin, “Pakistan’s Nuclear Weapons: Proliferation and Security Issues,” CRS Report for Congress, Congressional Research Service, March 19, 2013, p. 5.
- 540 (480) *a bold attack on the headquarters of the Pakistan army*: See Gregory “Terrorist Tactics in Pakistan,” pp. 5–6.
- 541 (480) *Another attack penetrated a naval aviation base*: *Ibid.*, pp. 6–7.
- 541 (480) *the roughly seventy thousand nuclear weapons built by the United States*: Cited in Stephen I. Schwartz, ed., *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons Since 1940* (Washington, D.C.: Brookings Institution, 1998), p. 102.



- 542 (480) *a success rate of 99.99857 percent*: Or to put it another way, if a single nuclear weapon had been stolen or detonated, it would have represented a little more than one thousandth of 1 percent of the entire stockpile.
- 542 (480) *the rate of industrial accidents*: Due to variations in record keeping among different countries, any comparison between their accident rates will be imprecise. Nevertheless, the figures that have been compiled do give a sense of relative technological mastery. As the authors of this study found, the “difference in accident rates between developed and developing countries is remarkable.” The workplaces in the developed world are much safer; perhaps 350,000 people die on the job every year, mainly in developing nations. See Päivi Hämäläinen, Jukka Takala, and Kaija Leena Saarela, “Global Estimates of Occupational Accidents,” *Safety Science*, no. 44 (2006), pp. 137–56.
- 542 (481) *That rate is about two times higher in India*: According to the study, the rate of industrial accidents in the United States is 3,959 per 100,000 workers, and the rate in India is 8,763 per 100,000. *Ibid.*, pp. 145, 147.
- 543 (481) *three times higher in Iran*: The rate in Iran is 12,845 per 100,000. *Ibid.*, p. 153.
- 543 (481) *four times higher in Pakistan*: The rate in Pakistan is 15,809 per 100,000. *Ibid.*, p. 148. 482 “*A World Free of Nuclear Weapons*”: George P. Shultz, William J. Perry, Henry A. Kissinger, and Sam Nunn, “A World Free of Nuclear Weapons,” *Wall Street Journal*, January 4, 2007.
- 543 (482) “*The world is now on the precipice*”: *Ibid.*
- 543 (482) *the two nations that control about 90 percent of those weapons*: Cited in Madeline Albright and Igor Ivanov, “A New Agenda for U.S.-Russia Cooperation,” *New York Times*, December 30, 2012.
- 543 (482) *The campaign to eliminate nuclear weapons*: For a fine account of today’s antinuclear movement, see Philip Taubman, *The Partnership: Five Cold Warriors and Their Quest to Ban the Bomb* (New York: HarperCollins, 2012). For a detailed look at how such disarmament might occur, see “Modernizing U.S. Nuclear Strategy, Force Structure and Posture,” Global Zero U.S. Nuclear Policy Commission, May 2012. And for a strongly contrary point of view, see Rebeccah Heindrichs and Baker Spring, “Deterrence and Nuclear Targeting in the 21st Century,” Background on

- Arms Control and Nonproliferation, The Heritage Foundation, November 30, 2012.
- 543 (482) *“Some argue that the spread of these weapons”*: “Remarks by President Barack Obama, Hradcany Square, Prague, Czech Republic,” The White House, Office of the Press Secretary, April 5, 2009.
- 544 (482) *“Such fatalism is a deadly adversary”*: Ibid.
- 544 (482) *“a world without nuclear weapons”*: Ibid.
- 544 (483) *an average age of seventy-nine*: Nunn was sixty-eight; Perry, eighty; Kissinger, eighty-three; and Shultz, eighty-six.
- 544 (483) *Bush’s counterforce strategy*: For an analysis of how the Bush administration planned to use nuclear weapons, see Charles L. Glaser and Steve Fetter, “Counterforce Revisited: Assessing the Nuclear Posture Review’s New Missions,” *International Security*, vol. 30, no. 2 (Fall 2005), pp. 84–126.
- 545 (483) *“nuclear disarmament fantasy”*: Harold Brown and John Deutch, “The Nuclear Disarmament Fantasy,” *Wall Street Journal*, November 19, 2007.
- 545 (483) *“Hope is not a policy”*: Ibid.
- 545 (484) *In 2010 a group of high-ranking Air Force officials*: James Wood Forsyth, Jr.; Colonel B. Chance Saltzman, USAF; and Gary Schaub, Jr., “Remembrance of Things Past: The Enduring Value of Nuclear Weapons,” *Strategic Studies Quarterly*, vol. 4, no. 1 (Spring 2010), p. 82.
- 545 (484) *almost 200 fewer weapons*: A report by the two groups suggested that in the future the United States will need only five hundred nuclear weapons for deterrence. See Hans M. Kristensen, Robert S. Norris, and Ivan Oelrich, “From Counterforce to Minimal Deterrence: A New Nuclear Policy on the Path Toward Eliminating Nuclear Weapons,” Federation of American Scientists and the Natural Resources Defense Council, Occasional Paper No. 7, April 2009, p. 44.
- 546 (484) *the problems with a strategy of minimum deterrence*: The morality of killing civilians as an act of vengeance—after their leaders launched a nuclear attack—has always been an awkward subject for deterrence theorists. In a recent book, the author Ron Rosenbaum questioned the ethics of a retaliatory nuclear strike and urged missile crews to disobey any order to launch: “Nothing justifies following orders for genocide.” For a provocative

analysis of the issue, see John D. Steinbruner and Tyler Wigg-Stevenson, “Reconsidering the Morality of Deterrence,” CISSM Working Paper, Center for International and Security Studies at Maryland, University of Maryland, March 2012; and Ron Rosenbaum, *How the End Begins: The Road to a Nuclear World War III* (New York: Simon & Schuster, 2011). The quote can be found on page 260.