Gravity's Shadow

Edward Jones-Imhotep


This well-written and scrupulously researched book addresses a significant anomaly in the way that the U.S. government has planned for nuclear war: "How and why, for more than half a century, has the U.S. government seriously underestimated the damage that nuclear weapons would cause? How and why did the government, in devising its plan to fight strategic nuclear war shortly after World War II, develop detailed knowledge about the blast damage caused by nuclear weapons but fail to develop knowledge about an even more devastating effect?" (p. 1). The effect in question is mass fire, or what is more popularly known as "firestorm."

Lynn Eden describes the historical context that led to this state of affairs. Prior to World
War II, U.S. bombing doctrine grew to favor "precision" bombing aimed at targets considered central to the enemy’s war effort. By contrast, the British favored blanket bombing, more suited to night raids in which the bombers were less vulnerable to air defenses. To achieve the best results from such blanket bombing, the British quickly came to see the value of incendiary bombs for causing fire damage in cities, whereas the U.S. preference for precision bombing made high-explosive bombs the weapons of choice.

Despite the advent of nuclear bombs at the close of the war, the U.S. approach to bombing remained largely unaffected. As Eden notes, “a conception of employing atomic weapons to carry out precision bombing doctrine may seem absurd”; owing to the rather indiscriminate destructive power involved, the planners “incorporated the atomic bomb into their inherited sense of organizational goals, knowledge, and problems to be solved” (p. 94). However, Eden’s detailed and nuanced account shows that in practice Curtis LeMay’s Strategic Air Command was too pragmatic to be overly focused on precision targeting. Instead, the early postwar period, when atomic bombs were scarce, saw SAC mainly geared toward leveling cities. However, SAC planning depended on target intelligence provided by the Air Force’s Air Intelligence Division, and here the assessment of target hardness was based entirely on blast effects.

This bias in favor of investigating blast damage but not fire damage became particularly significant with the advent of the hydrogen bomb and higher-yield nuclear weapons because the thermal energy released increased proportionately more than blast overpressures. Unfortunately, the one significant attempt to study the effects of fire misconceived the issue by failing to distinguish between line fires (started by one or a few initial ignitions) and mass fires (with many near-simultaneous initial ignitions). The study failed to demonstrate a method for predicting fire effects, and thus fire effects were considered unpredictable. Although the nuclear test program collected data on thermal effects (including the bizarre but gruesome exposure of pigs dressed in military uniforms), these effects were considered significant simply for the direct damage caused and not as a possible initiator of mass fire.

Things began to change only in the late 1970s, when Harold Brode, a defense consultant specializing in nuclear weapons effects, began to develop a model for fire damage. Rather than attempting to derive an understanding from the messy and limited empirical evidence, Brode worked from “first principles” to produce a simple model of what happens following a nuclear detonation. Using this model “led to overall fire damage estimates that were broadly consistent with the historical data on damage from atomic bombing” (p. 236). Despite its questionable empirical basis, the model was to prove persuasive because of its theoretical elegance. Fire effects began to be taken more seriously in U.S. targeting, although not, it appears, to such an extent that war plans have actually been changed.

Eden’s account relies heavily on organizational inertia for explanation, arguing that once particular contingent factors have led to a problem-solving approach this then becomes institutionalized. In turn, this means that vested interests form around continuing the chosen approach and that alternatives are neglected. It is easy to understand how organizations are resistant to change, especially where the substance of their work involved heavily knowledge-laden routines. The more difficult question to answer is why organizations nevertheless do sometimes change.

Graham Spinardi


The Fraser, like other large rivers along the Pacific Coast, inspired dreams of hydroelectric development and the prosperity that would follow. The river’s enormous potential for waterpower attracted numerous dam proponents throughout the twentieth century—and yet its main stem has never been dammed. This book explains why, focusing on a fisheries conservation coalition that sought to save the Fraser’s prolific salmon runs. While set in the Fraser River Basin in British Columbia, the “fish versus power” debate expanded into national and international politics, and Matthew D. Evenden’s history has global, as well as local, implications.

His analysis of the role of science is especially interesting. The book begins with the 1912–1914 landslides at Hell’s Gate, which blocked the migration of sockeye, prompting efforts to restore the river and develop a transnational research program. Scientists assumed a prominent position in the fish versus power debate during the mid-twentieth century, as pressures for hydroelectric development mounted after World War II. In addition to researching the effects of dams on salmon migration, fisheries biologists increased the public profile of science by advis-
Explode a nuclear bomb over a city, and the result will be a devastating firestorm which will wipe out life over a large area. That is, after all, what happened at Hiroshima and Nagasaki in 1945. But according to Lynn Eden’s fascinating investigation, Whole World on Fire, the impact of mass fires has been ignored by US nuclear war planners for the past 50 years. They have focused instead on the damage caused by the blast, and… Continue reading. Whole World on Fire focuses on a technical riddle wrapped in an organizational mystery: How and why, for more than half a century, did the U.S. government fail to predict nuclear…

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Lynn Eden. Whole World on Fire: Organizations, Knowledge, and Nuclear Weapons Devastation. Xiv + 365 Pp., Index. Ithaca, N.Y.: Cornell University Press, 2004. $32.50. [REVIEW] Graham Spinardi - 2005 - Isis 96 (3):459-460. Whole World on Fire: Organizations, Knowledge, and Nuclear Weapons Devastation. [REVIEW] Graham Spinardi - 2005 - Isis 96:459-460. The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons Since 1945. In This Review. Whole World on Fire: Organizations, Knowledge, and Nuclear Weapons Devastation. Whole World on Fire: Organizations, Knowledge, and Nuclear Weapons Devastation. In most discussions of nuclear policy, it is enough to know that exploding weapons cause unimaginably horrific damage over an extended area. In this exhaustive study of a problem that the author herself calls "undeniably weird," however, Eden wants to know why damage assessments focus so much on the effects of blast that they underestimate the damage of the firestorms that result (and thus underestimate the total impact of a nuclear explosion). The standard answer is that the effects of the latter are much harder to calculate. Stanley N. Williams Arizona State University. Tempe. Whole World on Fire: Organizations, Knowledge, and Nuclear Weapons Devastation. Lynn Eden Cornell U. Press, Ithaca, NY, 2004. $32.50 (365 pp.). Eden begins Whole World on Fire with a dramatic description of the effects a 100-kiloton bomb would have if exploded at ground level at the Pentagon, just across the Potomac River from Washington, DC. She then compares the 100-kiloton device to a 10-kiloton weapon also detonated on the surface. Not surprisingly, given the specific case, she finds that the radius at which the 10-kiloton bomb would ignite buildings and trees is greater than that at which its blast would destroy buildings.