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Paul G. Gillespie, *Weapons of Choice: The Development of Precision Guided Munitions*, The University of Alabama Press, 2006. xii, 218 pp. Illustrations, notes, bibliography, index.

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One of the more memorable Doonesbury strips from the 1990-1991 Gulf War was a riff on the videos of precision-guided munitions (PGMs) striking targets in Iraq . Garry Trudeau's fictitious briefer narrated for reporters as a bomb on the video traveled closer and closer to a targeted building. When the video ended, the briefer told pool reporters that, regrettably, the bomb navigated precisely through the building's ductwork only to exit the building on the other side out an open window and detonate harmlessly in the parking lot. In the last panel, a reporter raised a hand to ask whether coalition forces were really winning.

While precision-guided weapons were in the end a relatively small portion of the munitions used in 1991, in the popular conception of warfare a new era had emerged. Smart bombs and Tomahawk cruise missiles would make warfare very, very different from anything before. Indeed, this possibility led some air power enthusiasts to assert that in the future warfare could consist largely of "surgical" air strikes, obviating the need for ground troops or the danger of civilian casualties. The experiences of the last decade have evaporated such optimism, but the fact remains that the presence of such weapons systems will continue to have a substantial influence on all forms of military operations.

How these weapons came to be is the subject of Paul Gillespie's clear, concise and readable account. *Weapons of Choice* is not an encyclopedic or exhaustive exploration of precision-guided munitions. In places the research is thin while many possible topics are untouched or treated only lightly. Instead, it is a closely argued analysis, largely from the perspective of the United States Air Force, of the development of air-dropped glide bombs guided to their final target. This is a growing and important area of historical research, and Gillespie's book joins recent ones by Donald Hanle, David Mets and Kenneth Werrell.

In the work, Gillespie aims at three things. He seeks to explain why the Paveway series of laser-guided bombs came to be, what the sources of that technological innovation were, and what the implications of these weapons have been for U.S. national security policy subsequent to the Vietnam War.

Focusing almost exclusively upon combat over land, Gillespie's account reaches back to World War I and the Kettering "bug," one of the first attempts to merge remote precision guidance with aerial weaponry. Through the interwar period, the U.S. Army carried out some research into this elusive puzzle, but found that the technology available (gyroscopes and radio) did not yet match the vision. Wartime exigencies, Gillespie explains, did help to expedite research into such weapons again in World War II, leading to the Azon guided bombs and Aphrodite radio-guided bombers (specially modified B-17 and B-24/PB4Y bombers packed with explosives). Despite these advancements, the vision of a bomb dropped onto a precise location while minimizing danger to the delivery crew still exceeded the technology available. With the arrival of the atomic era in August 1945, it no longer seemed to matter. Yet despite the postwar commitment to airpower and atomic weaponry, the Korean War revived interest in PGMs, leading to the Razon and Tarzon guided bombs. The Eisenhower administration's subsequent adherence to massive retaliation and thermonuclear weapons—and thus cost reductions and deterrence of great power war—meant that national security policy and Air Force doctrine turned away from the need for precision-guided conventional

munitions. In what is really the heart of the work, Gillespie then explores the consequences of this for the United States in Vietnam and the development of the Paveway bomb in 1966-1967. The final chapters address the post-Vietnam prominence of later PGM variants in the U.S. arsenal and the implications of this adoption of PGMs for national security policy in the post-Vietnam and post-Cold War eras.

Gillespie concludes that laser-guided glide bombs spawned by the Paveway series could only come to fruition because of the integration of several factors: national security policy that tolerated limited (i.e. non-nuclear) wars, a military doctrine that accepted the use of conventional weapons, wartime exigencies in Vietnam, and technological antecedents. The limiting factor was for a long time the available technology, but with the arrival and integration of lasers and semiconductor integrated circuitry, the weapon became possible. While individuals mattered in their aggregate efforts, no single individual held the 'breakthrough' responsibility for PGMs. The result has been, in his estimation, a modification of national security policy since Vietnam and the Cold War to embrace the use of PGMs and the problematic greater willingness to resort to force when force entails merely the use of PGMs.

The work does have drawbacks. While Gillespie is careful to assert that the weapons technologies were the result of collaborative works and that there was no meaningful prime inventor, he minimizes the importance of facilitators, whose organizational, procedural or bureaucratic role makes integration of technological systems possible. For example, he contradicts his argument by championing Colonel Joe Davis, the commander of the special limited war office detachment at Eglin Air Force Base. His budgetary access and bureaucratic prowess were apparently critical for the development of the first Paveway. Few other government officials appear. There is little discussion of the weapons acquisition process, either on how the system works or how it evolved over time to accept PGMs. There is little on finance or budget concerns here; though we might well wonder how senior policymakers evaluated the promise of PGMs against the budgetary cutbacks in the lean late 1920s, after Vietnam or the end of the Cold War. There is little attention to the post-1947 army's use of PGMs, to the navy's

interest in PGMs over water, or to cruise and ballistic missiles. To be fair, Gillespie explicitly sets cruise and ballistic missiles aside, but if the Paveway series was the product, in part, of technological antecedents then we should ask how developments in guidance with these other systems played a role. We should also wonder whether the problems and requirements unique to the army and navy made different PGM types more attractive to them. We are given little insight into the implications of changes in computing, laser targeting, actionable intelligence processing, or tactical communications, though these too were critical for making the PGMs a success on the battlefield and altering national security policy. In short, the analysis leaves us with many unanswered questions.

Still, the argument about the national security implications of these weapons, and their impact upon the American way of war, is one that others will take up in earnest. Gillespie's book is a step towards answering those questions. Though not definitive, this work will be important reading for historians of technology and military affairs trying to think about complex questions of fire control, weapons development and military communications, and their effects on strategy and policy.



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