THE EFFECTS-BASED APPROACH TO OPERATIONS (EBAO)

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The Air Force designs, plans, conducts, and assesses operations according to an effects-based approach. An effects-based approach is "an approach in which operations are planned, executed, assessed, and adapted to influence or change systems or capabilities in order to achieve desired outcomes." In the most basic sense, this entails determining the effects that the military should create in order to accomplish the military objectives that help achieve the military strategy, as it contributes to overall strategic success—and then applying the best combination of capabilities to create those effects. **EBAO is not a planning methodology; *it is a way of thinking about operations* that provides guidance for design, planning, execution, and assessment as an integral whole.** In a more comprehensive sense, EBAO is an approach that emphasizes:[1]

- Operations are driven by desired ends (end states and objectives), and should be defined by the effects required to attain these ends, not just by what *available* forces or capabilities can do, nor by what the Air Force "customarily" does with a given set of forces.
- Commanders should realize they are dealing with interactively complex problems not solvable by deterministic or "checklist" approaches. Interactive complexity carries implications that are important for commanders to realize.
- The "human element," "friction," and the "fog of war" can never be eliminated.
- There is never a single "right" solution. Commanders seek solutions that are "better" or "worse" and solving one set of problems often causes others to emerge.
- Commanders seek solutions that are most effective first–the solutions to achieve the objectives and end state—and then, given that, strive for efficiency.
- Commanders try to maximize options available and thus consider integrated use of all available military means and other instruments of power (IOPs) to gain continuing advantage within a given strategic context.

A GUIDE TO EBAO

The concepts and guidelines described in this section are not wedded to the term "effects-based"—they could have as easily been described as an "objectives-," "outcomes-," "results-," "impact-," or "consequence-based" system of thought. Nonetheless, "effects-based" is the term that is most widely recognized in Air Force

[1] Note that this list of considerations is not exhaustive.

circles. Further, this approach fully complements and helps reinforce the general considerations for military operations and strategy described in the previous sections. The section below presents a more complete explanation of the body of sanctioned ideas that define EBAO, but also presents general considerations that are often ignored in military literature on strategy, and which should help shape the thinking of commanders and strategists. (The order in which the explanatory paragraphs are presented does not necessarily represent their relative importance or priority—these may change from operation to operation.)

EBAO is a comprehensive approach—it cuts across all domains and dimensions, all disciplines and partnerships, all levels, and all IOPs. EBAO provides an overarching way of thinking about action that encompasses operational design, planning, execution, and assessment of operations involving all IOPs across the range of military operations (ROMO). It is not directly tied to any specific strategy or type of operation. It should not mandate a particular strategy, such as "parallel attack" or the "indirect approach," but should help commanders and planners consider all options in the context of the objectives and end state(s). "All" in this context encompasses:

- ***All domains and dimensions*—**Air Force forces exploit the vertical dimension, the electromagnetic spectrum, and time to create effects within the air, space, and cyberspace domains in ways that other forces do not or cannot. From this multi-dimensional perspective, Airmen can apply military power against an adversary's entire array of diplomatic, informational, military, and economic IOPs. It may be easier to defeat adversaries in a domain where they are strong through operations in another domain where they are weak. By exploiting airpower's speed, range, and flexibility, precision, tempo, and lethality, commanders can also gain significant temporal advantages over an adversary, as when pacing operations faster than the adversary can adapt in order to cause psychological shock and paralysis.

- ***All disciplines and partnerships*—**Airmen should consider that their own set of capabilities or "tools" may not offer all, or even the best, options for solving a problem in a given situation. Other functional specialties, components, Services, agencies, or international partners may offer the best prospect for creating particular desired effects.

- ***All levels*—**This means breaking down the boundaries between the strategic, operational, and tactical levels of war, realizing, for instance, that events with even a limited tactical impact can have immense strategic consequences.

- ***All instruments of power*—**EBAO entails the conscious integration of all the IOPs, leveraging the capabilities of the US Departments of State, Commerce, and Homeland Security, among others, to complement military operations. However, it may also entail aligning with the complementary power of partner nations, non-governmental organizations such as the International Red Cross, and even multinational corporations. An effects-based approach can often be more important to non-combat operations, such as stabilization and civil support, because outcomes in these types of operations require integration of many non-military components with military action and are thus more interactively complex than some types of combat operations, requiring more careful anticipation of effects.

EBAO is about creating effects, not about platforms, weapons, or particular methods. An effects-based approach starts with desired outcomes—the end state(s),

objectives, and desired effects—then determines the resources needed to achieve them, while identifying critical resource limitations. It does not start with particular capabilities or resources and then decide what can be accomplished with them. It also assigns missions or tasks according to mission-type orders, leaving decisions concerning the most appropriate mix of weapons, units, and platforms to the lowest appropriate levels within a given organization. Air Force commanders should encourage commanders from other Services, when tasking the Air Force or air component, to request particular effects instead of specific assets. Further, while EBAO is not about technology, there are new platforms, weapons, and methods that can enable new types of effects. These do not become truly useful to the warfighter until they are joined with appropriate employment doctrine and strategy. Tanks, radios, and airplanes by themselves did not yield *Blitzkrieg*.

EBAO integrates strategy—all design, planning, execution, and assessment efforts—into a unitary whole. These should be inextricably bound together, because effective and efficient execution almost always involves design, planning, and assessment in some form as well, even if not as part of a formal or "official" process. Effective operations should be part of a coherent plan that logically supports and ties all objectives and the end state together; the plan to achieve the objectives should guide execution; and that means of measuring success, gaining feedback, and adapting to changes should be planned for and evaluated throughout execution. Strategy encompasses all the means through which courses of action (COAs) are developed and evaluated, such as the Adaptive Planning and Execution (APEX) system at the national level, the joint operation planning process (JOPP) at the joint force commander (JFC) level, and the joint operation planning process for air (JOPPA), formerly known as the "joint air estimate process," at the component level. These are the collaborative, iterative, and adaptive processes that help integrate strategy from national through joint force component levels. The JOPP and JOPPA are integral and complementary to the APEX process: Adaptive planning describes force and logistical requirements, while the JOPP and JOPPA outline the objectives and tasks military forces are to accomplish.

Operational design and planning set the stage for all subsequent planning activities and thus are where sound effects-based principles may have the greatest impact. Execution encompasses and implements all the various tasking processes and the ongoing operational battle rhythm, as well as all the individual unit actions that comprise implementation of airpower operations; integrating, synchronizing, and deconflicting their accomplishment, as well as disseminating mission-critical information to those needing it. Execution that is not effects-based often devolves into a "checklist mentality," that becomes excessively process-driven and loses sight of the larger context (such as the objectives and end state). This can negate sound planning, as when focusing too narrowly on one or another aspect of the battle rhythm—for example, air tasking order production. Execution that is not effects-based runs the risk of devolving into blindly servicing a list of targets, with little or no anticipation of or adaptation to enemy actions or changes in the operational environment like weather. Assessment encompasses all efforts to evaluate effects and gauge progress toward objective accomplishment. Assessment is used to adapt operations as events unfold and thus feeds the revision of plans. One should always attempt to measure performance of actions and the effectiveness of those actions in terms of creating desired effects and achieving objectives.

EBAO emphasizes that war is a uniquely human endeavor—a dynamic and often unpredictable process involving the collision of interactively complex, adaptive

systems. War is a contest of human wills, a clash of living forces that creatively adapt to stimuli. This has implications that have not always been fully exploited in the US approach to conducting operations. Airmen should note that operations other than warfare—even operations during steady-state or peacetime conditions—are often interactively complex and entail many of the same considerations discussed below.

War's outcome is never easily predictable or guaranteed, plans should never be considered static or prescriptive, unforeseen circumstances are always "in play," the adversary always "has a vote," and the ability to adapt often equals the ability to survive or succeed. Commanders and strategists should be wary of any plan, technique, methodology, or wargame that claims to offer deterministic or predictive insight into warfare's outcome. **The approach to operations—especially warfare—should not be deterministic; military success ultimately relies on the judgment of commanders as well as the will, insight, and moral courage of all participants in the conflict.**

Operations—especially warfare—are non-linear and "interactively complex." Classical Western culture and scientific method are based on analyzing and designing structurally complex systems, which contain many moving parts,[2] but which behave according to linear and predictable cause and effect relationships—the behavior we expect from properly-performing machines. Interactions of living systems are always interactively complex, even if structurally simple (few moving parts). This means that the interaction of components is non-linear and the results are not easily predictable according to deterministic rules of cause and effect, unlike that of most machines. In structurally complex systems, components interact with each other dynamically and adaptively, determining overall system behavior and affecting how constituent parts and sub-systems behave and adapt. New and unanticipated behaviors emerge as system elements interact. Adding the element of "will"—the ability of system components to freely make choices—can add further orders of magnitude to the complexity of problem solving. Understanding gleaned from engineering and scientific disciplines (arrived at using discrete, isolated experiments) can be unreliable in understanding military operations, especially in war and often cannot explain real-world outcomes when dealing with actors possessing free will. Theories incorporating interactive complexity try to better explain and predict these outcomes. Aspects of structural complexity that normally apply to machines and "conventional" scientific inquiry (and that most people are accustomed to) may no longer apply because of interactive complexity, as the following paragraphs explain.

- **Input/Output Proportionality**[3] means that system outputs are directly proportional to inputs—small inputs lead to small outputs and large inputs to large outputs. However, in practice, small inputs often lead to unexpectedly large outputs. This insight has been the key to good military practice for millennia: great commanders have always sought ways to have the greatest effect on the enemy for the least expenditure of lives and resources. An often-cited example is Doolittle's raid on Japan in 1942, which achieved only very minor tactical effects in the short run, but

[2] The more "moving parts" a system has, the more structurally complex it is.

[3] Use of "proportionality" here refers to its scientific meaning. However, the term also has a very specific meaning as part of the law of armed conflict: "Proportionality may be defined as the principle that even where one is justified in acting, one must not act in a way that is unreasonable or excessive. Proportionality has also been viewed as a legal restatement of the military concept of economy of force." (*Department of Defense Law of War Manual.*)

which changed Imperial Japan's entire approach to the war, by demonstrating Japan's vulnerability to direct attack. This directly resulted in Japan's decision to attack Midway Island, where the subsequent American victory altered the course of the war decisively in the Allies' favor. Conversely, poorly informed choices can lead huge inputs to yield operationally insignificant outputs, as was the case with World War I's trench warfare, a classic example of a needlessly wasteful attritional approach.

- **Additivity** means that the whole equals the sum of its parts, but this is not true of living systems, which are more complex and often greater in output than the sum of their components, just as the joint force working as an integrated whole is more effective than its components working independently ("synergy"). The behavior of interactively complex systems often depends more upon the linkages between components than upon the components themselves. In fact, system-wide behavior often cannot be deduced from analysis of the component parts (see "*reductionism,"* below*)*.

  One example is human social interaction—individuals are often defined by their social connections, such as jobs, family, and group affiliations rather than by individual characteristics and these affiliations drive much behavior, even though the connections are often chosen by internal, individual motivations. Clearly also, people consist of only a few dollars' worth of common chemicals and water but when "assembled" represent the best example of the whole being greater than the sum of the parts.

- **Replicability** holds that the same inputs always yield the same outputs, as usually seen with machines and controlled experiments conducted by mathematically linear rules, but this is untrue of more complex phenomena. In fact, replicability is a central tenet of scientific inquiry, in which researchers strive to isolate experiments from outside influences to permit others to replicate their procedures. However, outside the laboratory, many unknown and uncontrolled variables and system interconnections continually make exact replication of results impossible. What worked in the last "similar" operation often provides guidelines for current operations, but no two operations are ever the same. "Sameness" is an illusion, but similarity[4] often yields useful insights. That is why doctrine is authoritative—advocating best practices—but not directive. However, repeating the pattern of any operation (at any scale) should be avoided when possible, as doing so is what an adversary is likely to expect.

- **Predictability** is a corollary of replicability, allowing the consequences of actions to be anticipated consistently and repeatedly. This is an important aspect of the testability of hypotheses according to the scientific method. With respect to interactively complex phenomena, however, friction and the "fog of war" must be dealt with, meaning the effects of "the numerous chance events, which touch everything" and "the numerous difficulties that inhibit accurate execution of the precise plans that theory tends to formulate."[5] This encompasses the impact of danger, exertion, and exhaustion on the ability to think and act effectively; on uncertainties and imperfections in the information on which plans were based; and in the play of unpredictable circumstances upon operations. Despite increases in the

[4] "Same" and "similar" are often regarded as synonymous in common usage, but for military purposes, "same" denotes "identical," "similar" denotes having many common features, but not identical.
[5] Carl von Clausewitz, quoted in Peter Paret, *Clausewitz and the State*, p 191.

effectiveness and pervasiveness of intelligence, surveillance, and reconnaissance (ISR) capabilities, fog and friction have remained pervasive elements of war and other military operations. An obvious example affecting air operations is weather—which can have a huge operational impact, but is usually predictable only within a narrow range of time.

- **Reductionism** is the common scientific method of analyzing systems, by "pulling them apart" conceptually and examining how each component operates separately to determine overall system behavior. It has been the main technique behind machine design for centuries, as well as "nodal" methods of "systems analysis." However, reductionist methods may yield less insight than ways of examining systems as a whole—analyzing how the system behaves in relation to other systems in its environment, as well as how components of the system interact, and then trying to anticipate how the interaction of these systems may cause certain types of behavior, or allow new behaviors to emerge. Breaking a complex problem into constituent, structurally complex parts and solving each part will not necessarily solve the overarching problem, just as winning every battle does not guarantee winning a war. Victory most often also depends upon the interactions of all the instruments of power wielded by all actors in a conflict, which strategists should examine when designing and planning operations.

- **Cause and effect** can be traced, often via a linear progression, from a particular cause through a chain of logically connected, predictable effects. However, causes and effects are often hard to trace and harder to demonstrate, since common "linear" rules frequently do not apply—especially in cases involving human will. Emphasizing this might seem ironic in an approach claiming to be based on anticipating "effects," but it is a central insight that warfighters should understand: **most cause-effect relationships important to them involve indirect and often intangible, unquantifiable linkages that are normally discerned inductively (through real-world observation), not deductively (by being able to prove a theorized outcome through logic alone)**.

  Returning to the 1942 Doolittle raid as an example, Allied planners anticipated a boost in US morale and corresponding loss of Japanese home front morale, and they created these indirect intended effects. However, they also altered the thinking of the Imperial Japanese high command, leading to withdrawal of Japanese Army aircraft from China to Japan, which had significant operational-level effects on the Allied campaign in China, and setting the Imperial Japanese Navy on the road to Midway, which proved decisive in the Central Pacific campaign—unintended indirect effects that could not be foreseen. In many cases, effects will accumulate to achieve objectives, but progress may not be evident until the objectives are nearly achieved. In other cases, the mechanisms through which they are accomplished may not be readily apparent. Warfighters should be aware of this, seeking ways to increase anticipatory situational awareness and understanding, counseling patience to commanders and national leadership with respect to results. Progress often is assessed qualitatively, not quantitatively, since it is far more difficult to evaluate unfamiliar, ill-structured, dynamic, and interactively complex problems.

- **"Stopping rules"–**In statistical analysis and clinical trials, scientists make rules that define when an experiment or problem is "over" and assessments can be made. In real world practice, such rules do not exist, so events continue to evolve and systems continue to change even when planned end states have been reached. It is

rarely, if ever, possible to leave complex systems in stable equilibria "after the war is over" and one set of problems often bleeds inexorably into another. World War II (WW II) ended as decisively as any major event has in modern times, leading victorious Allied governments into a degree of complacency, until the closely entailed problems of post-war recovery of shattered Axis nations and the aggressive expansion of communism forced the Allies to design plans to meet these challenges.

In a related sense, "real-world" problems usually don't yield a single "right" solution, only "better" or "worse" outcomes in terms of continuing strategic advantage. A substantial design effort was put into the recovery of Europe as a whole, leading to the Marshall Plan, Containment doctrine, and the Berlin crisis not escalating into war. In Asia, on the other hand, much effort was put into Japan's recovery, while Korea and China received relatively little attention. Japan's recovery was relatively swift and smooth, while China and northern Korea fell to communism and the Korean peninsula erupted in war not five years after the end of WW II. Some have argued that the "solution set" for Europe was "better;" that in Asia, "worse" for the interests of the US and its allies.

EBAO should account for how all actors, especially the adversary, may respond and adapt to planned actions. Good design and planning should anticipate change. All interactively complex systems adapt to changes in their environments and any systematic approach to warfare should account for this. An effects-based approach includes processes to account for likely adversary responses and adaptations. Commanders and strategists should also consider that the beliefs, customs, and habits of adversaries who do not ascribe to a Western worldview may not respond in ways anticipated by Americans ("mirror imaging"), potentially creating unanticipated and unfavorable higher-order effects. Mirror imaging the motivation of an implacable enemy in North Vietnam—assuming that Communist leaders would respond to limited-war offensive measures and gradual escalation of the conflict in a measured, "rational" manner when those leaders had devoted their entire lives to the struggle to "liberate" Vietnam—was a mistake that was a major factor in the failure of US strategy.

EBAO focuses on behavior, not just physical changes. The force-on-force approach to warfare made destruction of the enemy's military forces the leading aim in war, usually accomplished through attrition—wearing the enemy down through fire and maneuver until their losses exhausted them—or annihilation—destroying their main strength directly, resulting in their complete overthrow. These methods accomplish objectives and are still valuable parts of strategy, but EBAO emphasizes that there are alternatives; that the ultimate aim in war is not just to overthrow the enemy's military power, but to compel them to do one's will. Careful examination of all types of effects often suggests more effective and perhaps less costly options than attrition or annihilation. Another aspect of this principle is one can often achieve objectives more effectively (and efficiently) by maximizing the psychological impact of friendly operations upon an adversary, as when coalition "tank-plinking" conditioned Iraqi armor crews to abandon their vehicles during Operation DESERT STORM, but this applies not just to the fielded forces, but to leadership and other critical systems of control as well. One can carefully tailor messages to adversary populations, encouraging cooperation or other desired behavior from them. Finally, affecting the behavior of friendly and neutral actors within the operational environment can often be as important as affecting adversary behavior. When establishing rules of engagement (ROE) that prohibit striking cultural or religious landmarks during operations, for instance, the intended "target" in doing so is likely to be a friendly and neutral audience more than the adversary. As a

consequence, the integration of strategic communications themes and IO are vitally important to overall strategy. For the steady state, EBAO may also focus on the capabilities military partners require or can wield, not on specific platforms; upon access, not bases; and upon relationships between partners, not the specifics of actual agreements.

EBAO seeks to achieve objectives most effectively, then to the degree possible, most efficiently. Operations should always accomplish the mission, but planners should seek to provide alternatives to attrition and annihilation, which are often among the *least* efficient means of achieving ends in war. Thorough evaluation of the range of possible effects should lead to COAs that achieve objectives in ways that best support the desired objectives and end state, but do so with the least expenditure of lives, resources, time, or opportunities. The ultimate aim is to be *effective*. The paradoxical nature of effective strategy sometimes requires that *inefficient means* be employed (see vignette). Airpower may often be the most effective means of achieving objectives because it cannot easily be countered, not because it is most efficient, although it may be so, particularly in terms of lives. Sometimes this requires a strategy based on attrition or annihilation, but these should be selected only after careful deliberation has determined that they are the most effective (or only) choices.

Effective versus Efficient

Consider an ordinary tactical choice… To move toward its objective, an advancing force can choose between two roads, one good and one bad, the first broad, direct, and well paved, the second narrow, circuitous, and unpaved. Only in the paradoxical realm of strategy would the choice arise at all, because it is only in war that a bad road can be good precisely because it is bad and may therefore be less strongly defended or even left unguarded by the enemy. Equally, the good road can be bad precisely because it is the much better road…more likely to be anticipated and opposed….

A paradoxical preference for inefficient methods of action, for preparations left visibly incomplete, for approaches seemingly too dangerous, for combat at night or in bad weather, is a common expression of tactical ingenuity – and for a reason that derives from the essential nature of war…when there is a live enemy opposite, who is reacting to undo everything being attempted, with his own mind and his own strength.

—Edward Luttwak, Strategy, the Logic of War and Peace

EBAO should consider all possible types of effects. Warfare has traditionally focused on direct effects and more immediate indirect effects like attrition. An effects-based approach should, to the extent possible, consider the full array of outcomes in order to give decision-makers a wider range of options and provide a realistic estimation of unintended consequences. Each type of effect can play a valuable role in the right circumstances and thinking through the full range encourages a flexible and versatile approach to war fighting. Airmen today can offer a wider array of options to commanders than they could at any time during the past. To explore the full range of possible effects in particular contexts, commanders and strategists should also make use of people with in-depth cultural, historical, and regional knowledge, such as foreign

area officers, air advisors, mobile training team members, and naturalized personnel. The intelligence community should offer effective federation of intelligence sources from across the United States government and multinational partners. Leveraging this knowledge, together with dynamic interaction with the ISR community, offers the best option for acquiring the requisite information and understanding it in context. In assimilating information, another consideration is the abundance of data available to decision-makers, and the inherent difficulty of deciphering useful information. The volume of information itself becomes a form of friction, precipitating confusion, lengthening decision times, and diminishing anticipatory awareness.

Knowledge of the Operational Environment is Critical, but Ultimately Limited. The operational environment is the composite of conditions, circumstances, and influences that affects the employment of capabilities and bears on the decisions of the commander.[6] Understanding of the operational environment should account for interested parties not directly involved in the conflict; the physical environment; threats to the joint force; and the overall cultural, historical, political, and economic context of the conflict, not just the characteristics of the adversaries or their systems. On the other hand, the very volume of data available to be turned into "actionable" information often creates a form of friction, and even "perfect" knowledge (assuming such is possible) may *not* impart predictive awareness of events, contrary to some opposing claims.

EBAO is not new. Sun Tzu wrote, "to subdue the enemy without fighting is the acme of skill…thus what is of supreme importance in war is to attack the enemy's strategy." This intuitive application of effects-based tenets was echoed by Napoleon when he said, "If I always appear prepared, it is because before entering on an undertaking, I have meditated long and have foreseen what may occur." History's great commanders approached warfare from an effects-based perspective, though not so named, when they looked beyond mere destruction of enemy forces to the more general problem of bending the enemy to their will, in the process considering the full range of means through which this was accomplished. "Effects-based" is simply a catch-all for some of history's best practices, coupled with doctrine and some recent refinement of concepts, such as complexity, that enables proper employment of many recent capabilities. In many ways, EBAO is an elaboration of the "strategy-to-task" methodology that has guided Air Force planning for decades and is directly analogous to "maneuver warfare" theory advocated by the United States Army and Marine Corps.

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[6] Based on JP 3-0, *Joint Operations*.