The important measure is not the targets destroyed but rather the effect on the enemy's capabilities and actions.

Fing for Fifeds

By Brig. Gen. David A. Deptula

N the predawn darkness of Jan. 17, 1991, Air Force Maj. Greg Biscone piloted his huge B-52 bomber toward Wadi Al Kirr airfield, a fighter base in central Iraq and one of the Gulf War's prominent first-night targets. Nearby, another Air Force B-52 also was speeding toward the base.

The BUFFs' aim points on that night were the taxiways linking Wadi Al Kirr's runway and hardened aircraft shelters. The bombers dropped low for the approach and, in a matter of minutes, the B-52s executed a textbook multi-axis attack, crippled the airfield, and turned for home.

By that time, stealthy F-117s already had struck targets in downtown Baghdad. Tomahawk cruise missiles followed, blasting electrical and communication systems in the capital.

F-15E fighters over western Iraq attacked launch facilities from which Scud missiles could hit Israel or coalition nations.

As Biscone's B-52 turned toward home, coalition raids commenced at four more fighter bases. Elsewhere, 13F-117 attack aircraft bombed command bunkers, communications exchanges, interceptor operations centers, and satellite downlink facilities.

In western Iraq, 30 aircraft attacked chemical weapon facilities. Thirtyeight others shut down Shaibah airfield north of Basra. Forty-four blasted surface-to-air missile sites near Al Taqqadum airfield, Habanniyah oil storage area, and three chemical weapons precursor facilities.

Republican Guard headquarters came under attack. Suspected biological weapons storage sites were hit. So were critical oil storage facilities.

Conventional air launched cruise missiles—launched from B-52s after an epic flight from the US—hit key electrical facilities at Al Mawsil in the country's northern reaches.

This all happened in the first few hours of the Gulf War. And by the end of the first day, coalition warplanes also had hit bridges, military support factories, and naval facilities.

Coalition aircraft forces had in a single 24-hour period flown some 1,300 offensive sorties against 152 targets—the most separate-target air attacks in the history of air warfare. Indeed, the Gulf War began with strikes against more targets than were hit by the entire Eighth Air Force in 1942 and 1943.

It was not just the sheer number of sorties that made Day 1 so unusual, however. Just as important, if not more so, were the specific effects produced by this bombing activity. The war's first night demonstrated that the conduct of war had changed. It marked the birth of "effects-based"

Shock Wave. In the Gulf War, swift attacks with precision weapons paralyzed Iraq's ability to act. Here, an aircraft engine lies in front of a demolished fighter shelter at Jalibah air base in Iraq.





Fig. 2



This figure shows a parallel circuit. The switch closes and electrons flow to all bulbs at the same time, in simultaneous flow. The system is not vulnerable to a single-point failure. Applying the same concept to the application of force in war yields the terms serial (sequential) and parallel (simultaneous) warfare.

Fig. 1

The word "parallel" in "parallel warfare" comes from basic circuitry. A series circuit is shown at left. When one closes the switch, electrons flow from a source to five light bulbs. However, electricity must pass through <u>each</u> light before lighting the next—setting up the danger of single-point failure. This is called "sequential" flow.



operations, or EBO, as a principal means of conducting warfare.

The air campaign capitalized on emerging capabilities and was built around highly adaptive attack plans. These plans were shaped to paralyze Saddam Hussein's ability to control his forces, neutralize the ability of those forces to fight, undermine their will to fight, reduce the size of Iraq's military production base, and create conditions needed for control of Iraq's capacity to build weapons of mass destruction.

This approach allowed coalition forces to avoid Iraq's principal strength—its vast, heavily armored defensive armies—and thwart Baghdad's ability to inflict massive casualties.

It is a concept that has come to be known as "parallel warfare" and was based upon the coalition's ability to achieve specific effects on, not the absolute destruction of, targets.

The concept can best be understood through an analogy. Electrical circuits are of two basic types—serial and parallel. In the series circuit (Fig. 1), one closes a switch and electrons flow from the power source to the first bulb. Current must pass through each light before it can light the next.

In the parallel circuit (Fig. 2), closing the switch sends current to all bulbs simultaneously, and each lights up in an independent way. The concept, in war, describes an operation in which forces attack all major targets at more or less the same time, to attain cascading effects.

The object of parallel war is to achieve effective control over the set of systems relied on by an adversary for power and influence—leadership, population, essential industries, transportation, and forces.

Before the Gulf War, air campaigns took on targets sequentially, striving to "roll back" enemy defenses so aircraft could attack targets of highest value. Area and point defenses had to be eliminated before war planners could gain access to what they really wanted to attack.

In Fig. 3, depicting sequential attack, the early warning sites, airfields, operations centers, anti-aircraft artillery, and SAM systems are targeted. Each target clears the way for the next one until finally the target of value, in this case leadership, can be hit. The effort and time required to suppress enemy defenses limits the number of targets that can be attacked at one time.

Fig. 4 depicts simultaneous attack against the same set of targets. Hitting all pieces of a defense system eases the attack on high-value targets but still leads to a somewhat sequential application of force. The majority of targets are defenses en route to and in the area of the target of value. Such a partial simultaneous attack can be accomplished with large force packages of nonstealthy aircraft in discrete areas or in a onetime attack on a limited target set. However, the large force packages to suppress enemy air defenses tend to limit the total number of areas that can be struck.

Simultaneous attack on all objectives opens a door to major changes in warfare. It permits surprise at the tactical level, a larger span of influence, fewer casualties, paralyzing effects, and reduction in time required to gain control over the enemy.

Fig. 5 depicts simultaneous attack against a wider array of critical targets. Leadership facilities, refined oil and electricity, transportation



Series Warfare - Sequential Attack

Fig. 3

Before the Gulf War, airmen applied force sequentially to "roll back" defenses. They had to eliminate area and point defenses to gain access to what they really wanted to hit. Each step cleared the way for the next until, finally, a target of value—in this case, leadership—was hit. The huge effort made simultaneous attacks on targets impossible.

Fig. 4

Hitting air defense elements simultaneously eases attacks on main targets but still yields a somewhat sequential force application. Nonstealthy aircraft can conduct attacks only in large force packages in discrete areas or on a one-time attack against a limited target set. This produces little shock effect.



Parallel Warfare - Simultaneous Attack (Weighted Against Air Defense)



Parallel Warfare - Simultaneous Attack Against All Vital Enemy Systems

nets, connectivity between the leadership and the population, and fielded military forces are attacked at the same time. This dramatically expands the ability to control enemy actions.

Parallel war entails more than compressing sequential attacks into a single multifaceted attack. Parallel war exploits time, space, and levels of war to achieve rapid dominance. In the opening hours of the Gulf War, coalition forces exploited all three dimensions.

Time. Coalition aircraft struck more than 50 targets in the first 90 minutes of war and more than 150 in the first 24 hours.

Space. Attacks ranged over the entirety of the Iraqi battlespace. Distance did not bar attack on any target.

Levels of war. The allies mounted simultaneous attacks on targets of tactical, operational, and strategic significance.

Vigorous exploitation of time, space, and levels of war to achieve specific purposes is the essence of EBO. Rendering an enemy force useless is just as effective as eliminating it altogether.

Traditionally, military forces have achieved their goals through destruction of enemy forces. Centuries of surface warfare created a common view that such destruction was the intrinsic purpose of military forces and combat. However, war's ultimate purpose is to compel a positive political outcome. Use of force to control rather than destroy an opponent's ability to act opens up new possibilities.

Control—the ability to eradicate the strategic freedom of the adversary—does not necessarily mean eliminating all of that enemy's tactical actions. In the Gulf War, Iraq never lost the capability to fly individual aircraft sorties. However, these air sorties were of little or no consequence to the outcome of the conflict.

Critical to the concept of control is the ability to affect essential systems on which an enemy relies. Using force to inject incapacitating effects in an entire system can yield effective control over that system. You could also "control" a system by destroying it, but it would require much more military force for no better or more useful result.

Pursuit of effective control conserves military forces otherwise needed for destruction. This in turn expands the number of systems subject to control through force application. Case in point: It takes a certain amount of force to obliterate the air defense system around Baghdad but a much smaller amount to shut down a power grid supplying electricity to the system. Attacking in this way frees up aircraft for other purposes.

Fig. 5 Stealth

Stealth and precision permit airmen to strike a wide array of key targets all at once. This capacity to attack the entire array of high-value objectives with little or no effort to suppress enemy defenses produces tactical surprise, a wide span of influence, fewer casualties, paralyzing effects, and shorter wars.

> Effective control of enough of the adversary's enabling operationallevel systems will paralyze his ability to function at the strategic level. Ultimately, the enemy will be compelled to acquiesce to the will of the controlling force.

> In the Gulf War, coalition forces attacked in parallel at rates so high that Iraq had essentially no chance to repair lost assets or find alternatives and continue its resistance.

> Military planners have always seen the desirability and value of simultaneous attacks, but they had never been able to produce them. This was due to three factors:

> • Effective air defenses, which forced the attacker to divert aircraft away from the main attack.

• Inaccurate weapons, which produced a need to mass aircraft and bombs in order to have a chance of hitting the target.

• Lack of an operational-level concept focusing on the use of effects rather than destruction.

The first two shortcomings required technological solutions namely, stealth and precision guided weapons—which did not mature until the late 1980s. When they were in hand, planners were able to tackle the third factor.

For decades, airpower theories suffered from weakness in execution. The World War II campaigns against German ball-bearing and air-



Silver Bullets. Stealthy F-117s flew two percent of Gulf War combat sorties but hit 43 percent of targets. In the war's first 24 hours, F-117s hit 76 separate, high-value targets.

craft industries took seven months. The anti-transport campaign took five months, and the oil campaign took six months. These relatively long operations gave the enemy time to recover in other systems and escape a rapid paralyzing blow.

In the Gulf War, however, precision munitions obviated a need for mass. Coalition forces dropped 9,000 laser-guided bombs, but that understates their impact. In some cases, a single aircraft and one Precision Guided Munition produced the same result as a World War II raid of 1,000 airplanes delivering 9,000 bombs.

In short, the arrival of PGMs offset the need for mass attacks to achieve a high probability of success.

By the 1970s, radar detection and radar-guided surface missiles and guns had become a lethal fact of the battlespace. Experience in Vietnam and the 1973 Arab–Israeli war indicated that highly defended targets would yield to successful attack only when protected and attacked by large "force packages" to get strike aircraft into and out of a target area.

A typical force package during the 1972 Linebacker I campaign consisted of 62 combat aircraft (less air refuelers) to get 16 fighter-bombers into and out of a target area. This cut down the number of targets that could be attacked at any time.

Stealth—in the form of the F-117 provided the solution to this problem. Stealth radically reduced the number of aircraft, supporting personnel, and infrastructure required to effectively strike a large number of targets. In the Gulf, F-117s flew less than 2 percent of combat sorties but attacked 43 percent of targets on the master target list.

In a typical attack comparison, a nonstealth package of 41 aircraft was needed to hit a single target with three aim points in the Basra area. At the same time, 20 F-117s were sent against 37 aim points in areas of equally high threat, with no losses.

Conventional planners and intelligence personnel tend to think about targeting in terms of "required number of sorties" to achieve "desired damage against each target." An intelligence evaluation of Gulf air war progress demonstrates how one can be misled by a focus on individual target damage.

On Feb. 15, 1991, the coalition target-planning cell received a report on the electric target set. Not all targets included in the primary and secondary electric target set had been destroyed or damaged to a specific percentage. Thus, the analysis concluded, the coalition had not met its objective.

In reality, Baghdad's electricity system had ceased to function. The planning cell knew the true situation and reduced the number of planned strikes. Some Iraqi power plant managers even shut down their plants to avoid attack. Coalition air forces achieved their goal without exposing themselves to danger.

The Gulf War's initial attack plan called for shutting down Iraq's air defense command-and-control system through complete destruction. However, it was determined that there were not enough stealthy F-117s to destroy each of the nodes of the air defense system simultaneously.

The solution lay in effects-based targeting. Not all nodes had to be destroyed; attacks needed only to make them ineffective and unable to conduct operations during specific periods.

The attack plan was rewritten in a way that allocated fewer F-117 loads to some targets. This greatly multiplied the number of stealth/precision strikes available for use elsewhere.

The opening 24 hours of the air war saw the fleet of F-117s carry out attacks on 76 separate targets. For comparision, under the traditional destruction-based way of war, plans called for the F-117s to attack only two targets on the first day.

Planning for effects raises complex issues. Planners, working with intelligence officers, must determine which effects on each enemy system will contribute most to the attainment of military and political objectives of the theater campaign. This depends upon the specific political and military objective, enemy vulnerabilities, individual target systems, and weapon systems capabilities.

A campaign plan is highly dependent on the weapon systems available. Thus, an effective plan squeezes maximum impact from those systems—not in terms of absolute destruction of a list of targets but in terms of effects desired upon target systems.

Strategy means matching means and ends. Assigning certain air assets (means) to certain target systems to achieve specific effects (ends) is the basis of the new-style air campaign. It is generally articulated in a Concept of Operations that describes friendly force intentions and integration of operations to accomplish a commander's objectives.

Of concern here is not so much the CONOPS process or format but rather the philosophy underlying the air strategy.

In Vietnam, the Air Force devel-

oped a command-and-control organization to plan and execute air-tosurface attack. Known as the Tactical Air Control System, it emphasized allocating sorties to individual targets in support of ground operations. At the center of the TACS process was the Tactical Air Control Center. To a large extent, targets processed through the TACC were chosen and prioritized not by airmen but by ground commanders.

Battle damage assessment focused on destruction of individual targets. The function and organization of the TACS led many to confuse the efficiency of hitting individual targets with the effectiveness of achieving campaign objectives.

TACS was established in doctrine as the air command-and-control system for conventional war. Post–Vietnam change focused on expediting responsiveness, enhancing sortie generation rates, and incorporating modern systems to quickly process large Air Tasking Orders. The process received great emphasis, while development of air strategy got almost none.

In the 1980s, USAF's Tactical Air Command and the Army's Training and Doctrine Command developed extremely close ties. This helped elevate the Army's doctrine of AirLand Battle as TAC's de facto air strategy in regional conflicts.

In time, USAF attitudes changed. Basic Air Force instructional documents on target planning boasted a



Instant Gridlock. To achieve coalition goals, its aircraft didn't have to attack individual tanks or troop formations. Dropping a bridge, as shown here, would effectively halt the enemy's advance or block his line of retreat.

full chapter on targeting for AirLand Battle but contained no principles or guidelines for conventional strategic attack.

In short, the Air Force's largest and most influential conventional air command, TAC, entered the 1990s with its vision of conventional war almost totally focused on supporting the Army—a critical but by no means only capability of conventional airpower.

These thought patterns and views were apparent among TACC planners and intelligence personnel who were assigned to Central Air Forces





Out of Action. In Operation Allied Force, this Serbian airfield was hit repeatedly with precision weapons, which kept it out of operation. Note the bomb craters on the runway and nearby sites.

in Riyadh, Saudi Arabia, in the summer of 1990. Attention was focused exclusively on tactical operations. The prevailing procedures for designing an ATO produced a purely mechanistic application of sorties to targets in sequence.

They called it "servicing a target list."

Fortunately, the architects of the Gulf air campaign, who began work in late August 1990, did not limit themselves to the servicing-a-target-list approach. The design of the air campaign grew out of thinking about how to hit an enemy's systems to achieve specific effects contributing to the military and political objectives of the coalition.

Planning was based on a "centerof-gravity" approach. It began with a critical examination of potential strategic centers of gravity, their constituent operational systems, and led to identifying the set of individual targets making up each system.

Decisions about whether to stop or continue an attack depended on whether the coalition had achieved a specific effect. Individual targets were important only if the system was still operating. If the effects desired were achieved, it did not matter that individual targets may not have been hit.

Figs. 6 and 7 illustrate the subtle but significant difference between "destruction-based" and "effectsbased" operations. Fig. 6 shows two serial-targeting approaches—the single prioritized list and the multiple target set lists prioritized in sequence. The serial approach targets elements of an adversary's defenses that restrict access to certain targets—early warning radars, air defense systems, command-and-control nodes, and airfields. They are to be hit before production, government, and leadership facilities.

Series methodology can be applied to an entire target base or group of individual targets. However, attacking one system at a time allows the others to continue operations or recover from previous attacks.

Fig. 7 shows the parallel attack scheme, application of force against all targets in each target system at one time. With correct identification of target systems, the desired effect is likely. The simultaneous application of force in such a manner would enable friendly control over the adversary systems. When a force faces a target set too large to be struck through single attack, then planners should first focus on hitting those aim points that will produce the greatest impact.

Early attack operations are weighted to paralyze the air defense areas in which nonstealthy assets would operate. This is the reason for the skewing depicted in Fig. 7 toward the target sets A, B, C, etc., notionally representing air defense, airfield, and command-and-control target sets.

However, intelligence about the enemy never will be total. Moreover, an enemy will attempt to negate the effects of attacks. As a consequence, parallel war may involve more than one case of force application, even if there are sufficient resources to attack all known elements.

The advent of EBO calls for a basic realignment in war planning. The combination of stealth and precision redefines the concept of mass. Classical mass—that is, a large agglomeration of forces—is no longer required. Surface forces will always be useful, but massing surface forces to overwhelm an enemy isn't required to gain control of an enemy.

Nor is it necessarily the smartest course. It takes more aircraft to transport a single light infantry division to a war theater than it took to move all of the PGMs used in the Gulf War of 1991.

Early deploying forces should be those with a demonstrated ability to effectively influence an adversary. If the measure of merit for service transformations became one of desired effect per unit of lift—the degree that combat effectiveness increases for each quantity of lift expended—future lift requirements might actually be reduced.

Massed forces—air, ground, or sea—present a lucrative target to an enemy. Therefore, the traditionally accepted concept of "mass," a valued principle of war, becomes in some situations a vulnerability. Potential adversaries may capitalize on the massing of forces and associated build-up time to deny US access to a war theater. These anti-access strategies become more probable as delivery systems such as accurate ballistic missiles, cruise missiles, and weapons of mass destruction proliferate among potentially hostile states.

Since the ability to impose effects is independent of the massing of forces, the projection of force becomes more important than the development of force. The object of presence or mass is influence. The operative element of achieving influence is the threat or actual use of force to achieve a particular effect. If the same effect can be imposed without physical presence or mass, then in some circumstances deployed forces can be replaced by power projection.

Systems-based intelligence analysis is critical to the application of EBO. Planners need to know what an enemy needs to exert influence and conduct operations. Without that information, parallel war won't be effective. Exploiting advances in space-based systems, communications technology, and rapid information transfer can reduce this potential vulnerability by reducing the need for forward-based organizational elements.

Redefining the concept of mass, relying to a greater degree on force projection rather than force deployment, and aiming to control adversary systems rather than destroy them requires changes in the current approach to force management. The changes needed may include more reliance upon out-of-theater command, control, communications, computer, and intelligence organi-



Fig. 7

This parallel attack scheme applies decisive force against all targets in each target system at once. If each target is hit, effects desired within each system will likely occur. If all aim points cannot be hit in one attack, those of greatest significance in each set are hit first. This accounts for the skewing toward target sets A, B, C, etc., representing air defense, airfield, and command and control. Show

Fig. 6

Shown at left are two methods of serial targeting single prioritized list and multiple target set lists in sequence. The serial approaches initially target elements of an adversary's defenses. Attacking one target system at a time allows the others to continue operation or recover from previous attacks.



zations, distributive intelligence architecture, and "off-board" systems that can provide information direct to the user.

We are in a transition phase of the ongoing revolution in military affairs. Parallel war achieved through EBO departs from traditional strategies, but we fight with the tools available today. We must carefully manage the transition to the new instruments of war to assure their development is not restricted by the theories of the past and to adapt current systems to more lucrative strategies.

It is proving to be a difficult transition. The tendency to retain orthodox concepts and doctrine is strong when the means on which those concepts and doctrine were based still make up the bulk of the inventory. Military doctrine is invaluable in establishing a basis for force application, but it must not be allowed to constrain effective forms of application just because they are different and nontraditional.

EBO provides a useful construct on how to conduct war that can bridge the gap between the weapons of today and the weapons of the future. It allows useful application of current weapon systems as we acquire a new generation of tools needed to fully exploit the concept.

The air campaign in the Gulf War and the air war over Serbia used bombs and missiles on individual targets to achieve a specific effect within the parent system. These air campaigns gave us a view of the leverage that stealth, precision, rapid and secure information transfer, ready access to accurate positional information, and other cutting-edge technological systems can provide. However, while the aircraft/PGM match of the 1990s far exceeded the capability of the systems used during World War II, it still is crude compared to the ideal means for the conduct of EBO. We must continue to develop systems that will provide even higher leverage effects.

As technological innovation accelerates, "nonlethal" weapons and



The Edge. The Gulf and Balkan air campaigns revealed the kind of leverage offered by stealth, precision, rapid and secure information transfer, accurate positional information, and other cutting-edge technologies.

cyberwar enabled by information operations will become operative means in parallel war.

The ability to achieve effects directly against systems without attacking individual components would allow a concept of parallel war preferable to that of today. Indeed, the ultimate application of parallel war would involve few destructive weapons at all; the objective is effects, not destruction. Nonlethal weapons, information warfare, miniaturized highly accurate munitions, and spacebased systems might make such concepts a reality.

While nonlethal weapons and information warfare will allow us to further capitalize on the concept of targeting for effects while continuing to limit casualties, only new organizations and doctrine aiming to exploit EBO can fulfill the full potential of this concept. Nonlethal weapons and information warfare should enhance the ability of our forces to conduct operations to directly achieve desired effects. In this respect, recent attempts to develop and write joint military doctrine are helpful when their focus is on weapon systems capabilities and effectsbased planning rather than employment environment or presumptions of attrition and annihilation.

Parallel war through EBO does not exclude any force component in time, space, or level of war at the outset of any political-military challenge. However, that does not equate to each force always participating in every operation or to a degree in some proportion to their size or presence. Whoever can perform the operations to achieve the desired effects best at the time should have it assigned to them.

Optimum parallel war is dependent upon a functional organization encompassing not just the air component but the entire theater campaign (i.e., a joint force land component commander, a joint force naval component commander, as well as a joint force aerospace component commander) with a true joint force commander (not dual-hatted as a component commander as well) orchestrating the synergies of the entire force.

EBO can be applied in every medium of warfare. Even so, aerospace power's relative advantages—speed, range, flexibility, precision, perspective, and lethality—fit hand in glove with this new strategic construct. Joint aerospace power has the potential to achieve effects at every level of war directly and quickly. As a result, it will remain the dominant means for conducting parallel war through EBO in major regional conflicts in the future.

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