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Time-Sensitive Targeting Model

by

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The . . . dangers of failure in the preconcentrated action of widely separated portions of the army is now almost completely removed by the electric telegraph.

—Lt Gen Rudolf von Caemmerer, 1905

Almost a century ago, Lt Gen Caemmerer believed von Schlieffen's general staff had discovered a technological solution to the problem of conducting warfare at the operational level. Unfortunately, neither the electric telegraph, nor any of the technological innovations since, have provided a panacea for integration of all operational assets. We still have no concept that guides us in integrating all theater assets together to achieve dominant battlespace knowledge (DBK) for target engagement. The desired DBK cannot be achieved with single, isolated systems; we must build a "universe" of systems that maintains information superiority. We then must develop successful sensor-to-shooter "constellations:" those specific sensor and shooter combinations, out of the entire universe of systems, that may integrate their information for target engagement. What we need, then, is a model to describe how platforms interact to create targeting information, that can be used to systematically hone both the accuracy and timeliness of our targeting process.

This article will develop such a model to describe the sensors and shooter interaction needed throughout the target engagement process. Using this model, commanders may optimize sensor and shooter interaction for missions within their area of operations by ensuring the appropriate platforms are in-theater and on-station to produce the desired effects. The model also helps commanders rapidly recognize what capabilities they will lose when a system drops out of the constellation, and which assets they can use in its place to regain the desired capability.

Our Target Engagement is Changing

The manner in which US armed forces have maintained information and targeting superiority in military operations has evolved over the past few decades. During the 1970s and 1980s, our approach to air warfare was one of force-on-force combat against a comparable Soviet military. We determined where the targets were, prioritized them, determined how best to strike them, and relied on technology to keep us ahead in a war of attrition. Since then, we have shifted emphasis from "out-attritting" toward outthinking and outmaneuvering our post-Cold War enemies in a fast tempo war to achieve battlespace dominance.[1] Our current doctrine now dictates asymmetric use of aerospace power to apply our strength against an adversary's weakness. Information enhances our ability to outthink the adversary and employ force in a more timely and accurate manner. The current emphasis on timeliness and accuracy results from several different external developments: advanced technology, increased mobility of targets, increased political risk, and decreased resources. These four developments provide the impetus for developing a time-sensitive targeting (TST) model.

Technology. Advances in technology allow us to increase the tempo of warfare, and maintain information superiority. Advances in the accuracy and timeliness of sensors, the quantity of data presented on cockpit displays, and the capability of voice and data links allow more information to pass between assets. Information is now exchanged between sensors, and from sensor directly to shooter. Decreasing the time from detecting targets to engaging and destroying targets decreases our decision cycle, thus allowing us to maintain the initiative in military operations. We are making great strides to address Col. John Boyd's premise to shrink our own decision cycle and to make our decisions faster than our opponents.

Mobility. Meanwhile, our potential adversaries plan to counter our doctrine and capabilities.[2] Potential targets are now more mobile and thus more difficult to detect and locate. Our difficulty in destroying the Iraqi SCUD missile launchers during Operation DESERT STORM demonstrated our inability to integrate sensors to find and engage mobile targets within the traditional targeting cycle. By the time intelligence/surveillance sensors spotted the SCUDs, and the warfighting community began to mission plan for strikes against them, the launchers had moved to a new location. Timely target information "*proved to be just too difficult to obtain,"*[3] therefore we had to develop new tactics to counter a mobile threat. Such engagements, whether we call them "time-sensitive targeting," "flex targeting" or engaging "targets of opportunity," involve several basic functions: sensors first detect, then locate and identify the target. This information must then be disseminated to a shooter who will engage before the adversary can react ("shooter," refers to any asset that applies force on a target, be that using hard-kill weapons, electronic warfare, or information warfare methods). All of this must happen within minutes; using the traditional targeting cycle would miss opportunities.

Political Risk. The political environment has also changed. The American political establishment is now averse to risking the lives of American servicemen and, in fact, is becoming more averse to excessive casualties inflicted against the opponent as well. Popular support for involvement in conflict quickly evaporates in the face of excessive casualties or fratricide caused by incorrect targeting. This has been the case in several recent examples: the accidental destruction of an Iranian airliner in 1988; the mistaken shoot-down of U.S. Army Blackhawk helicopters in northern Iraq in 1994; and the unintentional targeting of the Belgrade Chinese embassy in 1999. The administration's aversion to political repercussions from such incidents drives our use of precision weapons, our targeting practices, and our rules of engagement (ROE). It is a challenging dilemma: do we minimize the risk of our own pilots by encouraging ROE such as beyond visual range (BVR) engagements, or do we increase risk to ensure these engagements are accurate and don't produce unacceptable enemy, non-combatant or friendly casualties? To address this dilemma, we continue to move towards maximizing accuracy to achieve the desired military effects while minimizing the risk of casualties.

Limited Resources. This emphasis on precision is also driven by our limited assets. Fiscal constraints limit the number of systems we may employ against a target.[4] General Charles A.

Gabriel, as the Air Force deputy chief of staff for plans and readiness, predicted in 1979: "*In future conflicts, our weapons must be employed selectively and with precision because we are force limited.*"[5] Therefore, we must hit the target and create the desired effect the first time, while risking a minimum number of assets. Economy of force also requires us to depend on multiple assets working together to engage a target.

These four external developments force us to integrate and operate in new ways to ensure timeliness and accuracy for target engagement. Constellations that work together to engage targets in a time-sensitive manner will enable us to fight this new fight. Both *Joint Vision 2010* and *Air Force Basic Doctrine* echo these expectations of the future battlefield. These two documents recognize that improved precision and a higher tempo of operations will be fundamental to future conflicts. According to *Joint Vision 2010*, "*dominant battlespace awareness will improve situational awareness, decrease response time, and make the battlespace considerably more transparent to those who achieve it."* One of the new operational concepts of *Joint Vision 2010* is "precision engagement," which stresses our ability to integrate systems to locate desired targets, and then provide situation awareness to command and control (C2) assets and shooters who employ weapons to produce the desired effect upon that target.

AFDD-1 reflects this new emphasis, highlighting Air Force capabilities to achieve this desired state of speed and precision. Aerospace power, as outlined in AFDD-1, is uniquely able to obtain and maintain information superiority to achieve precision engagement: "*Our overwhelming ability to observe our adversaries allows us to counter their movements with unprecedented speed and agility*" and thus "*dictate the tempo and direction of an entire warfighting effort."*

Both of these documents outline our final destination towards speed and precision. Yet the strategy for arriving at this destination remains incomplete. Two existing concepts help us to design a TST model to bridge this gap between where we are and where we want to go. First, Col. John Boyd's "OODA loop" (also known as the decision cycle) represents how a "system" should be adaptive to a changing environment, in order to observe, orient, decide and act at a faster rate than the adversary. By obtaining more information about the battlespace, discerning our opponent's actions and intentions, and then acting before he can react, we maintain the initiative in battle. The second concept is the combat identification (CID) matrix, employed by the E-3 AWACS and fighters in the counterair role to ensure compliance with a theater's ROE. The CID matrix describes the targeting functions required for an air-to-air engagement.

Unfortunately, these concepts fall short of addressing how to conduct time-sensitive targeting at the operational level. The OODA loop emphasizes minimizing the decision cycle, but is not specific enough to resolve operational targeting problems such as building targeting constellations. The CID matrix is too specific, focusing exclusively on air-to-air combat at the tactical level.

Filling the Gap with a Time-Sensitive Targeting Model

A coherent model is needed to represent the time-sensitive targeting (TST) process, as a means of analyzing current and future weapons systems integration for the operational level of warfare. A joint force air component commander (JFACC) must know what functions need to be accomplished to conduct TST, and then know which sensors are required to fulfill those functions. This model must therefore represent those functions necessary for conducting TST across the spectrum of operations, as well as factors that influence those functions. The model must reflect our emphasis on timeliness, accuracy, and interoperability of systems. Satisfying these requirements will enhance our ability to engage targets according to our current doctrine, namely using information and precision to outpace our adversary, to engage increasingly mobile targets, while accounting for increased political risk and decreased resources.

This article will develop such a model to describe the sensors and shooter interaction needed throughout the target engagement process. Using this model, commanders may optimize sensor and shooter interaction for missions within their area of operations by ensuring the appropriate platforms are in-theater and on-station to produce the desired effects. The model also helps commanders rapidly recognize what capabilities they will lose when a system drops out of the constellation, and which assets they can use in its place to regain the desired capability. It is this capability that bridges the gap between our tactical capabilities and our doctrine for information superiority and precision engagement. We begin by determining the key elements of the targeting process.

Functions of the TST Model

There are five functions of the time-sensitive targeting process used by theater intelligence, surveillance and reconnaissance (ISR) assets, command and control (C2), and shooters to designate and engage any enemy target. The first three functions—detection, location, and identification—are used to designate a target. These three functions can be accomplished *by* any number of sensors. These sensors are designated as either active (possessing an onboard radar used to detect reflected emission returns) or passive (collecting emissions produced by the enemy). The last two functions, fusion and dissemination, are necessary for correlating data from the first three functions to create targeting information then passed to a shooter for engagement. Fusion takes place *between* the sensors, while dissemination takes place *between* sensors, C2, and shooters, with operators interacting via voice or data link.

a. Detection (Figure 1)

The first function in the TST process is for a sensor to detect a contact of interest (a COI, or any data collected by a sensor that may begin the targeting process). We cannot engage something unless we somehow know it is out there. Both active (energy emitting) and passive (emission collecting) sensors can detect COIs. Detection can be a radar return from an active sensor such as an E-3 AWACS or an AEGIS cruiser. A COI can also be detected passively, for example by a SIGINT sensor (such as an RC-135V/W Rivet Joint, or RJ) that detects an enemy aircraft's radar emissions or a visual observer spotting an enemy aircraft's contrails. The characteristic which determines detection capability is a wide field of view (FOV) in whatever spectrum the sensor is operating. For example, a UAV may have a very detailed electro-optical sensor, but its flight parameters, range and airspeed may limit its FOV with respect to geographic coverage, and hence its ability to detect COIs. Similarly, some aircraft have very precise SIGINT receiver systems but don't scan through the entire frequency spectrum rapidly enough to be used as search and detect systems—again, a limited FOV. Therefore, a sensor with a wide FOV has the best probability of detecting COIs.[6]

Figure 1. The Detect Function.

b. Location (Figure 2).

The second function in the process is to locate the COI and produce coordinates for engagement. If the contact is moving, then this function must also produce an airborne or ground "track" (a COI's location as it moves with time). All subsequent action is based upon this location or track, so the JFACC should employ those sensors best able to build the most precise locations. For example, active sensors with high resolution radars, such as Joint STARS, build much more precise locations on a surface-to-air missile battalion than a passive sensor such as an EP-3E Aries II signals intelligence (SIGINT) aircraft.[7] Active sensors, then, are preferable for detection and location of COIs.

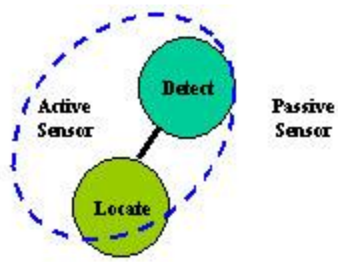

Figure 2. Detection and Location – Active Sensors.

c. Identification (Figure 3).

The third function is to identify the COI. An active sensor may be able to provide this type of information (with very precise radars of high resolution, such as synthetic aperture radars). However, passive sensors, such as imagery satellites and SIGINT assets, specialize in the identification of COIs. Experienced operators using accurate, sensitive collection equipment can correlate current observations of the battlefield to historical databases. Such sensors may differentiate between friendly and enemy surface-to-air missile launchers, or distinguish enemy fighter jets from civilian airliners. In some situations, the required identification accuracy is high. Knowing a COI is an adversary aircraft may not be enough; we may need to know it is an adversary *fighter* aircraft before we engage.

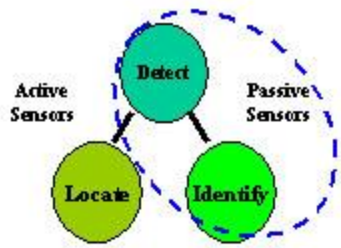

Figure 3. Detection and Identification – Passive Sensors.

The identify and locate functions do not have to occur sequentially, they can occur in parallel.[8] On individual platforms, the functions may be performed in sequence. Active sensors will likely detect and locate simultaneously (see Figure 4). For example, an AWACS radar detects and locates an airborne track simultaneously. The crew must then work toward identifying the track as a possible target. Passive sensors, such as an RJ, work in reverse. They detect and identify the COI, and then work toward building a location precise enough to pass on to other theater assets. By using multiple sensors, we can perform the locate and identify functions simultaneously, thus reducing the amount of time to produce targeting information. Tying the location function to the identification function is fusion.

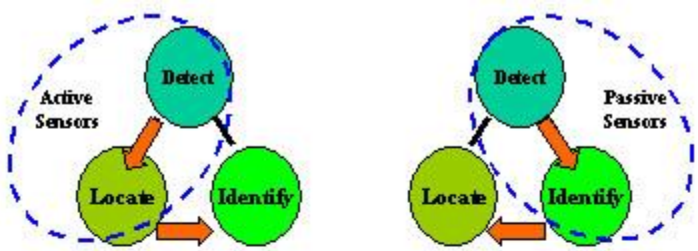

Figure 4. Active vs. Passive Sensor Determination of Targets.

d. Fusion (Figure 5).

Fusion is the process of combining the data gathered during the detect, identify and locate functions to develop targeting information. This can occur with a single aircraft, such as an A-10 pilot visually acquiring, and then engaging, an enemy tank. In doctrine, however, fusion usually refers to the interaction of multiple sensors, such as when an AWACS and RJ correlate information about an enemy fighter (AFDD 2-5.2). It is the fusion of information from multiple sensors that provide the synergy of multi-sensor targeting relationships, using the strengths of one system to overcome the weaknesses of another.

The fusion function encompasses both the means, such as voice/data links, as well as the methods, or the tactics, techniques and procedures (TTP) used by aircrews to communicate and correlate information. But the actual fusion of data is performed by people, not by systems or sensors. Knowledgeable operators on intelligence, surveillance, and reconnaissance (ISR) platforms (such as AWACS, Joint STARS and Rivet Joint) perform much of the fusion process, associating bits of information with other bits, while incorporating both current and historical information. Rapid exchange of information between operators on different platforms builds a common picture of the battlespace. When targeting information is incomplete, for example when the identity of a COI is still unknown, then operators turn back to their sensors to further refine the information. Data links, such as TADIL-J/Link 16 and future wide-band data link concepts show great promise for enabling fusion—all systems in the data link, including the shooters, may eventually share a common battlespace picture (Joint Pub 3-55). This will depend greatly on platform dissemination capability.

Figure 5. Fusion.

e. Dissemination (Figure 6).

The dissemination function is the link between sensors and shooters, and occurs when the final targeting information is passed to command and control agencies and the shooters for possible engagement. Like fusion, this function encompasses equipment such as voice/data links and real-time information into the cockpit (RTIC) displays, as well as the TTPs used by aircrews to pass this targeting information. Using these means, command and control can decide to engage reactively (such as when the air operations center receives information on a new target and directs the shooter to engage) or proactively (using published ROE that specify which targets will be engaged, if found). To be of any use, however, this targeting information must be disseminated in a format useful to the decision maker (to decide whether or not to engage) and to the shooter (to engage the target, if so directed). For example, passing geolocation coordinates to a pilot who is working with a theater central reference point is of limited tactical use.[9] This highlights the distinction between fusion and dissemination: fusion converts incomplete data into targeting information, while dissemination passes the complete targeting information to decision makers and shooters.

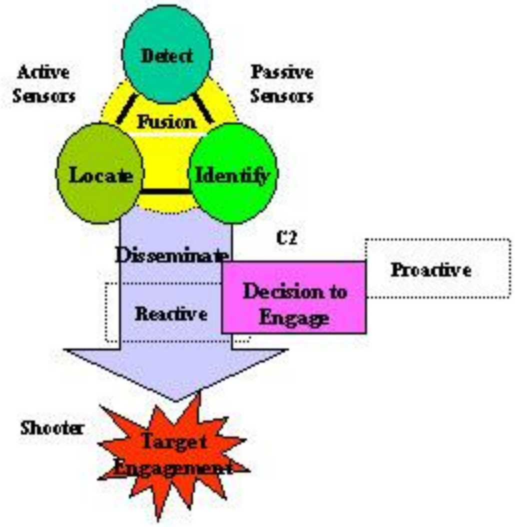

Figure 6. Dissemination.

Once the target information is disseminated to the shooter, is it useful? How precise a location do I need? How accurately must I identify a target before I can engage it? These are questions a JFACC must address before conflicts begin, and the answers must be clearly spelled out in theater ROE and special instructions (SPINS). There are several factors that determine the precision required within the TST process. Once we know the required precision, the model highlights which systems provide that precision.

Precision Factors of the TST Model

Two factors determine the precision required from the location and identification functions of the TST model. These factors are the type of weapons employed against the target and the theater ROE (which stipulate what force can be applied and how it can be applied). It is critical the theater JFACC be familiar with these precision factors, since the JFACC may have the ability to change them and, thus, alter the precision required in the TST model. Adjusting precision gives the JFACC a wider range of employment options.

a. ***Weapon Type (Figure 7).***

Once sensors have adequately identified the target, and the commander has committed the shooter to attack the target, the shooter must locate and engage it. It is the weapon the shooter uses to engage the target that drives target location precision, and thus limits the systems that may provide target location information. For example, a passive SIGINT sensor can locate a track with enough precision to employ a broad area weapon such as a HARM or Army multiple launch rocket system. This precision is not sufficient for GPS-guided weapons. Only an active sensor (a radar) or a passive imaging sensor can currently obtain this level of precision. In other cases, location may not be important at all. Jamming platforms do not require an extremely precise position of their target to successfully engage the target. The weapon drives the location precision required, and therefore the necessary sensors to determine that location. A JFACC must realize some of his sensors can not provide the location precision required by some precision weapons. Long-term planners must also realize that as the precision of weapons increase with technology, it must be matched by advances in those systems that locate targets.

b. ***Rules of Engagement (Figure 7).***

While weapon type drives location precision, it is the ROE that determine the level of accuracy required by the identification function of the TST model. Command and control directs shooters to engage targets according to theater ROE and target identification. Identification is ROE-dependent and may not have to be precise. Aggressive ROE, employed when political or military repercussions for mistakes are low, may allow commanders to use procedural methods to identify a hostile target. Kill boxes, free fire zones, no-fly zones, guilt-by-association, and point of origin guidance may not require much sensor accuracy to identify a contact as a hostile target. In other cases, moderate or even restrictive ROE may be necessary to minimize the risk of collateral damage or fratricide. Thus, as the risk of unintended consequences increases, the precision required for identification increases. JFACCs must recognize this correlation, understanding when they make the ROE more restrictive, they must match this with sensors capable of obtaining the precision required for identification.

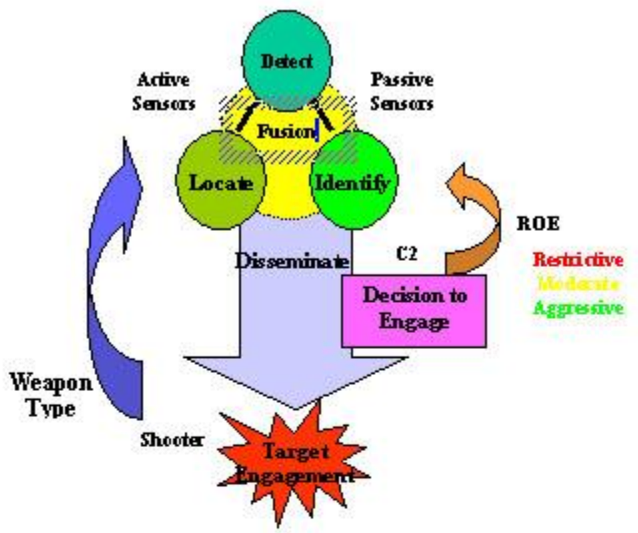

Figure 7.. Precision Factors—Weapon Type and ROE.

Let's look at an example of how a JFACC may influence target engagement using precision factors (see Figure 8). The target is a surface-to-air missile (SAM) site. How the JFACC wishes to engage this target determines the choice of weapons, and hence the sensor required to perform the locate function. If the JFACC wishes to engage with a jammer, location need not be precise. If the JFACC prefers to engage with high-speed antiradiation missiles (HARMs), or even with precision guided munitions (PGMs), then the precision required for the target location increases, and the required sensor may change. Meanwhile, ROE may be such that a COI can immediately be "identified" as a hostile target and engaged (e.g., aggressive ROE may direct shooters to engage any vehicle activity near a known SAM site). If the ROE is restrictive, and engagement must wait until the SAM site proves to be a threat, then a sensor must accurately identify the COI as a target, or the pilot must visually identify the target (unfortunately increasing the risk to the pilot). As the JFACC's acceptance of risk changes, so too does his ROE level, and the sensors required to fulfill the identification function.

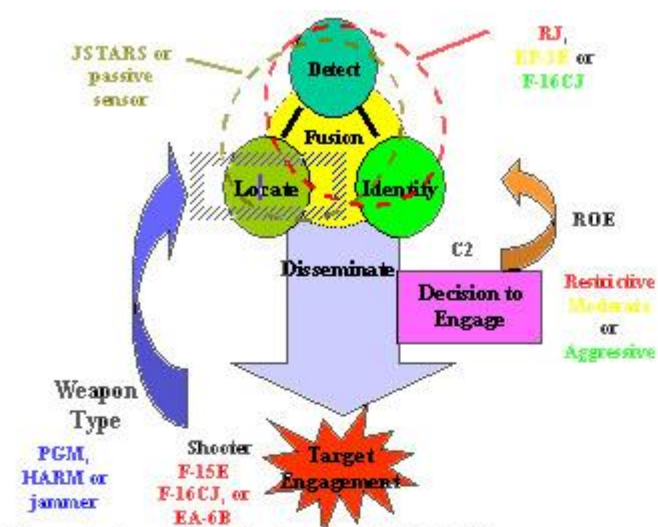

Figure 8. Engaging a Surface-to-Air Missile Site.

Application of the Model

The proposed model is designed to bridge the gap between doctrine and employment. Using the OODA loop and CID matrix as a foundation, the model expands to include all time-sensitive targeting engagements. Five targeting functions and two precision factors are instrumental to describing any targeting scenario. Of these, the detection, location and identification functions are accomplished by sensors. The precision required in the location function is driven by the type of weapon being employed. The accuracy required in the identify function is driven by theater ROE. Fusion takes place among sensors to complete the targeting information, which is then disseminated to C2 and shooters. The platforms which work together to accomplish all the targeting functions may be termed a "targeting constellation." The TST model not only describes existing targeting constellations, but also predicts future constellation requirements.

a. Existing Targeting Constellations

The time-sensitive targeting model must apply to many diverse target engagement scenarios. The following two scenarios describe existing targeting constellations using the TST Model.

Scenario 1. Engaging a Mobile Ground Target. (Figure 9). It is difficult to preplan interdiction ground targets in the fluid environment expected during the initial Halt Phase of a conflict. Time-sensitive targets, such as mobile SCUD missile launchers, may make it impossible to preplan strike coordinates. Therefore, bomb-droppers of the next conflict will likely receive their targets while airborne. This could occur with close air support, "flex-targeting" interdiction missions, or SCUD-hunting.

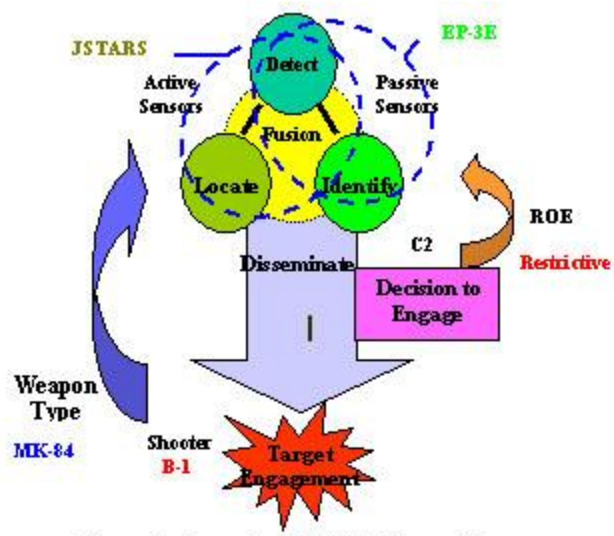

Figure 9. Engaging a Mobile Ground Target.

Scenario 2. Jamming a Communications Frequency. (See Figure 10). A SIGINT aircraft detects communications, and identifies it as enemy GCI communications. That aircraft is able to roughly determine the location, verifying that it is emanating from enemy territory. The location is not precise enough to engage targets with precision weapons, but is precise enough to provide targeting information to a jammer. The ROE are then consulted (in the form of the SPINS and joint restricted frequency list). If the "threat" (the enemy communications) is declared hostile, the threat is "targeted" by jammers such as the Compass Call.

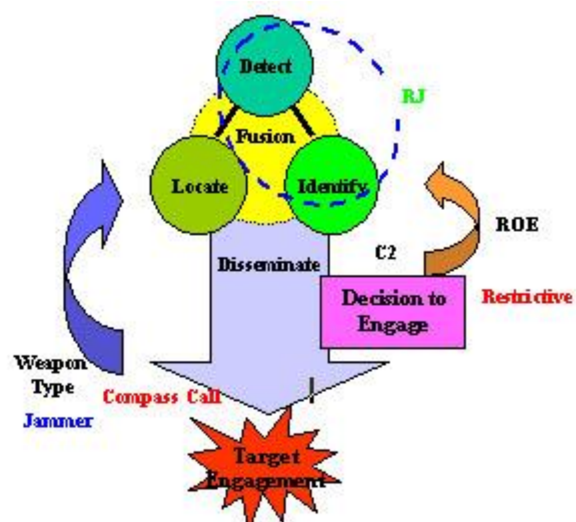

Figure 10. Jamming a Communications Frequency.

In this example, the passive sensor SIGINT aircraft performs all three initial functions of the TST process for target designation, and disseminates the target information to the shooter

(Compass Call). The shooter (the communications jammer) does not require location precision; the location provided by the passive sensor is precise enough to engage the target. ROE for jamming a communication signal is restrictive, thus accurate identification is crucial.

b. Predicting Future Targeting Constellation Requirements

The TST Model may also be used to create new targeting constellations. The Rivet Joint may be successful working with either the F-15E or B-1 bomber in an air-to-ground role (Figures 11 and 12). Both the F-15E and B-1 have very precise air-to-ground radar capabilities, but with limited FOVs. A passive sensor, by passing identified targets with rough locations, would allow the shooters to acquire time-sensitive targets and subsequently refine the location sufficiently to engage. In both cases, the Rivet Joint's broader field of view to detect the COI, and its ability to identify the target, enhances the shooter's ability to employ weapons on target.

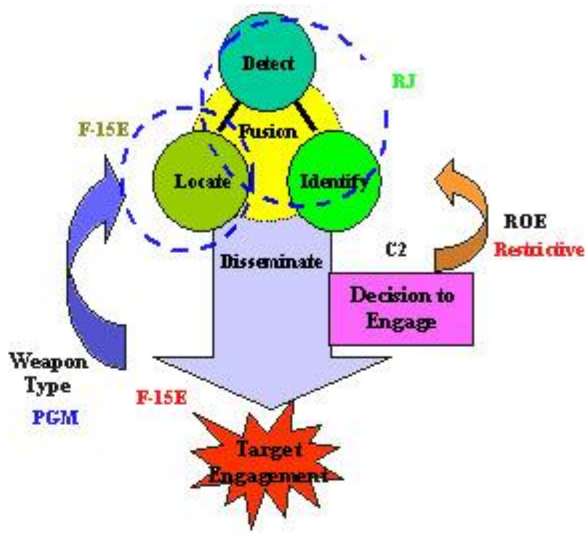

Figure 11. RJ/F-15E

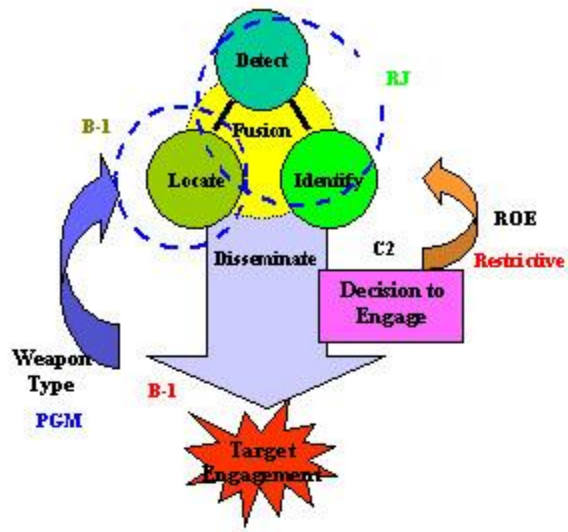

Figure 12. RJ/B-1.

Another targeting constellation can be formed using Joint STARS and UAVs or acoustics. (Figures 13, 14). If identification is the shortfall of Joint STARS, then this can be balanced by a UAV, with imagery identification capability. The Joint STARS could detect and locate COIs and direct UAVs into the area for electro-optical identification of the COIs. Once identified as a viable target, Joint STARS could direct shooters to engage. Future developments of acoustic sensors could also fulfill this identify function. Such sensors could be placed along key enemy lines of communication. When COIs are detected passing these sensors, Joint STARS could combine its detection and location (especially tracking) information with the identification provided by these sensors, and could then designate the COIs as viable targets.

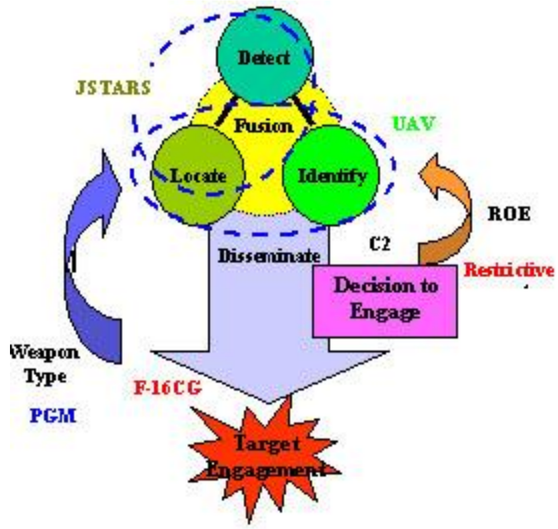

Figure 13. Joint STARS/UAV.

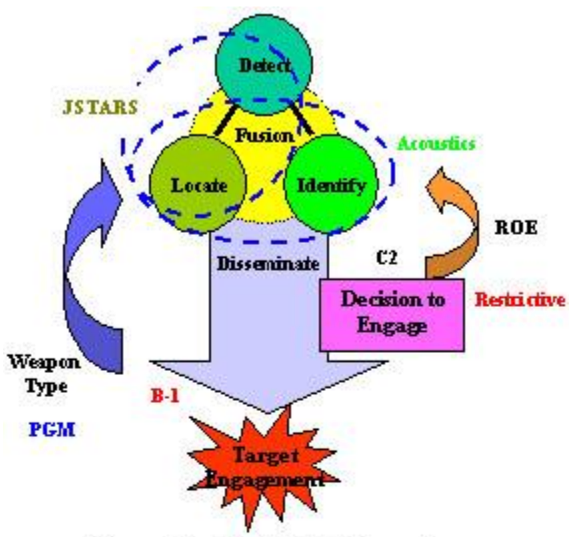

Figure 14. Joint STARS/Acoustics.

Conclusions

The TST model provides the JFACC a method for quickly optimizing sensor and shooter relationships, filling a gap between Air Force tactical and operational doctrine. It demonstrates the functions necessary for time-sensitive targeting, and evaluates assets that may fulfill each function. The model demonstrates which combinations of assets, out of the universe of sensors and shooters, best create timely and accurate targeting constellations—those combinations of systems that optimize time-sensitive targeting.

Using this model, a theater's JFACC may optimize the available assets. The JFACC also may use this model to recognize degradation, and develop workarounds when certain systems become unavailable. The JFACC may knowledgeably adjust the precision factors (either his ROE or his weapons) to adapt to whatever assets he has on hand. By applying this model, planners may proactively create new targeting constellations and establish new requirements. Once identified, planners should allow these new teams to practice their sensor-to-shooter interaction. Acquisition personnel can then identify shortfalls in targeting constellations and direct programs for correcting these shortfalls.

Academic study only goes so far. Once a sensor-to-shooter relationship is developed on paper, it must be put into practice. Assets must work together to prove or disprove the concept; aircrews must learn how to plan and employ within these new constellations. Only in actual operation do we discover the true obstacles to interaction. Only with practice can we overcome these obstacles, and firmly establish a true time-sensitive targeting process incorporating our tactics, techniques, and procedures. Perhaps then we will attain Lt Gen Caemmerer's dream of fully integrated forces for dominant battlespace knowledge at the operational level of war.

Notes

1. William A. Owens, *Lifting the Fog of War*, (New York: Farrar, Straus and Giroux, 2000), 100-101, 117-149.
2. James R. Brungess, *Setting the Context: Suppression of Enemy Air Defenses and Joint War Fighting in an Uncertain World* (MAFB, AL: AU Press, 1994), 169.
3. Edward C. Mann III, *Thunder and Lightening: Desert Storm and the Airpower Debates,* (MAFB, AL: AU Press, 1995), 151.
4. U.S. Congress, House, Oversight and Investigations Subcommittee, Committee on Armed Services House of Representatives, Intelligence Successes and Failures in Operations Desert Shield/Storm, 103rd Cong., 1st sess., 1993,Committee Print, 9.
5. Gen Charles A. Gabriel, "Tactical Reconnaissance for the 1980s," *Signal*, October 1979, 9.
6. Some systems do not detect, and yet are still valuable to the targeting process. Intuitively, this may not make sense—how can a sensor locate and identify a threat without first detecting it? We must return to our characteristic for good detection, namely a wide field of view. A Predator UAV may use its imaging sensors to precisely locate and identify a SCUD launcher, but with the limited FOV of its sensors, it could spend hours flying over the Iraqi desert before finding the launcher. Ibid. A sensor with a much greater FOV, such as a Joint STARS, can initially detect the COI and direct the UAV in for a closer look to more accurately identify and locate the target.
7. Air Vice-Marshal J P R Browne and Wing Commander M T Thurbon, *Brassey's Air Power: Electronic Warfare* (London: Brassey's, 1998), 208-210.
8. As opposed to the linear representation implied by the "Kill Chain" of Plan, Find, Fix, Track, Target, Engage, Assess currently supported by the Aerospace Command and Control, Intelligence, Surveillance, Reconnaissance Center (AC2ISRC) at Langley AFB, VA.
9. Shooters and ISR assets often use different reference systems for location. Fighter pilots often use a range and bearing based on magnetic north from a set reference point, or

bullseye. ISR assets often work with coordinates based upon latitude and longitude, while varying among platforms when reporting a bearing referenced to magnetic versus true north. When such a reference discrepancy exists, communication between these assets is extremely difficult and time-consuming.