

TOWARD A COMBINED ARMS TRAINING CENTER

Modern weapons systems have changed the tempo, the lethality, and the spread of battle. As U.S. Army divisions train for their foreseeable wartime missions, they have increasingly felt constrained within the land allocated to them at or near their peacetime station. Our Army must train as it expects to fight. It must have leaders who in peacetime exercises have learned to gauge terrain, to estimate weapon ranges, and to deal confidently with war's heightened challenges of time and space. It must have maneuver and fire support units that have developed the capability to move responsively and swiftly, to emplace, fortify, and camouflage, and to do so at night as well as in the day. It must have units who can use air power and defend against air attack. It must be able to contest the electromagnetic spectrum, to achieve superiority in that invisible domain as surely as over ground in front of a battle position. Yet, virtually everywhere it is stationed, the U. S. Army is hard pressed to provide such training. Land that once was ample for training divisions, is today scarcely adequate for exercising brigades. In most places where the Army is stationed, it is difficult, if not impossible, to train Army aviators in nap-of-the-earth flying, to fire air defense weapons, or to practice electronic warfare. The Federal Aviation Agency, the Federal Communication Commission, the Environmental Protection Agency, and other agencies or groups, public and private, operate to restrict the Army's use of its reservations, and the air space overhead. But the Army's posture at its current division posts is the subject of a separate TRADOC study.* Suffice to say here, we must look elsewhere. The purpose of this paper is to describe a U. S. Air Force approach to the problem of training for modern war, and to describe a possible parallel action by the U.S. Army that can offset some of the limitations of its present real estate holdings.

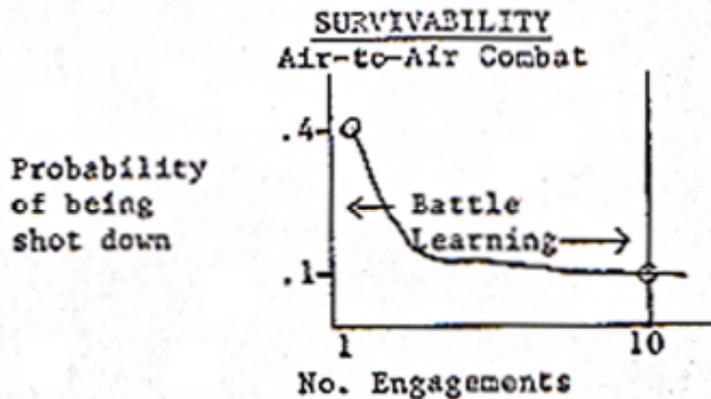
Training Management in the Tactical Air Command

The main burdens of the air war in Southeast Asia were borne by the Tactical Air Command of the USAF. TAC pulls few punches in describing its dissatisfaction with its performance in that war, particularly performance in air-to-air combat. Carrier fighter squadrons of the Navy did better than TAC squadrons, even when they were flying the same aircraft. TAC began to identify and redress some of the shortcomings in its training during the war, worked on other problems after the war, and about one year ago, brought to maturity a

* Subsequently published as DA Training Circular Training Land. TC-25-1, 4 August 1978.

very different way of training its forces. The method rests squarely on the proposition that air crews must train in peacetime under conditions which approximate as closely as possible those they can expect to encounter in battle: opposing an alert, aggressive enemy air force, flying in an active and dangerous electro-magnetic environment, and contending with an extensive ground based air defense system. The method requires squadrons to fly mission profiles (in terms of range, refueling, targets and enemy activity) that are a replica of those that could be flown in Germany (minus only the weather factor). The method is costly: TAC crews must now go to Nellis AFB, Las Vegas, Nevada for three weeks of such training at least once every 18 months.

In explaining why it set up an elaborate training complex at Nellis AFB, and incurred the expertise of moving crews and aircraft thither from all over the world, TAC cites a study by a Litton Corporation analyst, based on a survey of available data on air-to-air combat in World War II, Korea, and Vietnam.* The battle statistics indicate to TAC that combat is a powerful trainer.**



Weiss' data shows that, whereas pilots in their first combat engagement have had only a 40 percent chance of surviving, by their tenth engagement their chances of winning had increased to 90 percent.

Based on this information, TAC concludes that if its peacetime training could be sufficiently realistic to provide experiential

* Weiss, Herbert K., "Systems Analysis Problems of Limited War," Annals of Reliability and Maintainability, AAAIA, New York, 18 July 1966. This analysis focuses on "decisive combat," i.e., an engagement in which there is a victor.

** Weiss hypothesized that learning was less important than "survival of the fittest", meaning that selection of fighter pilots is more important than training. But his own subsequent analyses of U.S. submarine losses in WW II buttresses the "learning" interpretation. Based on 393 cases examined, "once a submarine commander scored a kill, his chances of further success as opposed to being sunk improved by a factor of three, and remained constant.

learning equivalent to those first 10 engagements, it would have a very much more survivable and effective force with which to fight the opening battles of the next war. If TAC's training renders invalid the historical loss rates, and teaches survivability to the extent TAC believes it can, the inventory of aircraft available to our air commander after his first air actions will be augmented by 30 percent. Or to put the advantage another way, with crews so trained, the Commander of U. S. Air Force Europe could shift the whole balance of air-power in favor of AFCENT in the first week of war. TAC is convinced that it can provide such training at Nellis AFB. TAC briefers describe an evolution in Air Force training management that began years ago with the recognition that the number of hours spent in training is no adequate measure of performance. From a training management system that was built around flying hours, TAG moved to an event oriented system, wherein aviators were required to drop bombs on certain ranges, or complete certain air-to-air gunnery exercises each year. As air warfare became more complex, and tactics began to require more cooperation among larger groups of aircraft, TAC training management advanced to "unit designed operational capability" for each type squadron (U.D.O.C.), wherein TAC prescribed what it was that each fighter squadron was supposed to be able to do, under what conditions, to specified standards. Then TAC decided that training in skies free of enemy air defenders was not an adequate evaluation of U.D.O.C., or a proper preparation for battle. Moreover, it became apparent that training for air-to-air combat, which pitted TAC flyers against other U.S. pilots using U.S. tactics in identical aircraft, was not useful training for dogfights with North Vietnamese MIGs. The answer, TAC discovered, was to establish squadrons equipped with aircraft which resembled the MIG in size and operating capability, manned by pilots trained in Soviet-style tactics. The U.S.Navy had been using this technique since 1969, and its pilots so-trained out-performed TAC pilots sixfold in ratio of kills to losses.

The Air War Over North Vietnam: 1965-1973
Air-to-Air Losses

Years	MIGs	U.S	Overall Kill Ratio	USAF Kill Ratio	USN Kill Ratio
1965-1968	110	48	2.29	2.25	2.42
1970-1973	74	27	2.74	2.00	12.50

Squadrons of TAC "aggressor" aircraft are now stationed at Nellis AFB, and figure prominently in the training exercises conducted there.

The final evolutionary step in TAC's training management it refers to as "multi-threat ranges", meaning the creation of a total combat environment: radio jamming, SAM and guns, realistic targets. In that environment units could be truly exercised in their designed

operational capability, as close to battle as modern technology can approximate.

Briefly, the training at Nellis centers on four facilities. There is an intelligence center wherein air crews are given an opportunity to examine Soviet equipment, or to watch television tape recordings of the weapons in the Soviet arsenal, and of the targets U.S. airmen can expect to encounter. Then there is an electronic warfare range where the airmen can try out their several cockpit detection devices and countermeasures equipment. 'Usually these cannot be even tested at home station, except in maintenance bench test conditions, but at Nellis the air crews can fly into a typical Soviet-equipped air defense, and experience first the various air defense warning radars coming into play to find them, followed by the radars which are directly associated with targeting them for SAM and anti-aircraft guns. On succeeding flights into this environment the "enemy" becomes more hostile: there is more adroit use of radar, and jamming takes place. The participating crews are allowed to use the full range of their ECM.*

The payoff battle training begins on the ACMI (Air Combat Maneuvering Instrumented) Range. TAC has thoroughly instrumented a portion of the desert approximately 35 miles in diameter, so that participating aircraft, carrying transponders that signal continuously information about the aircraft's altitude, speed, G-loading, and other information, are always visible at a monitoring station at Nellis. The instrumented range—which involves a dozen or so small, solar-powered relays—forms a vast arena into which pilots are sent for air-to-air combat against well trained "aggressors." Instructors at the monitoring site can see the "battle" in real time, and in great detail. The machinery is such that at a touch of a button, computer-generated imagery displays the situation from a chosen vantage point. They can elect to view the combat from above, or from the side, or from the perspective of the cockpit of any of the participants. Moreover, recording systems permit the entire battle to be captured on tape, so that when the combatants return, they can receive an extensive debrief of their tactics and flying techniques. While the air-to-air encounters are short—literally a matter of seconds—the debrief procedure can take hours, and the

* It is important to note that there are very few places in the United States—and indeed, in any part of the world where U.S. forces habitually operate—where such exercises would be feasible. In any inhabited area, the use of such equipment would disrupt television, radio, and microwave telephone service, and endanger civil air operations, thereby engendering public opposition to the training. Over Nevada's mountains and deserts, no one cares. There are only a very few such places left. Even the Army's large military reservations along the Mexican border (Fort Huachuca, Yuma Proving Ground, Fort Bliss) are not useable for such purposes because there we would invite hostile eavesdropping and technical monitoring from south of the border—like football scouts taking movies of a rival's scrimmages.

range system faithfully records all the data requisite to support in depth critique.

Finally, there is RED FLAG. In an area of the desert approximately 60 miles by 20 miles, TAC has created a piece of East Germany. Bulldozers have scraped out on the desert floor patterns resembling airfields of the Group of Soviet Forces Germany. Around these "airfields" are located dummy SAM and gun positions. On the runways are actual aircraft (target hulks). There are industrial sites, railroads, marshalling yards, tunnels and even a dummy convoy of trucks and tanks some 17 miles in extent along a winding road. The targets are made of wood or polyurethane foam. From the air, they look like the-real thing. They are surrounded by electromagnetic emitters that simulate the sort of signals that would be coming from actual installations or equipment. Participating squadrons are ordered to strike these targets, and they do so using 25-ib practice bombs and non-explosive cannon ammunition. But to deliver their ordnance, they must fly through the hostile electronic warfare, and through the defending aggressor aircraft. While the RED FLAG area is not as well instrumented as the ACMI (e.g., low-flying helicopters are invisible), all participating aircraft are charted on a large wall-size radar screen, and the outcome of air-to-air combat, or SAM counteraction, can be accurately gauged by instructors observing the radar plot. Once again, a recording is made of the action, so that a detailed critique can be held after each exercise. RED FLAG permits flexing most of TAG'S muscle: reconnaissance aircraft can be sent in to find the targets; long distance flights and air-to-air refueling can be staged; all important combat capabilities can be brought into play over the target; and there is even a provision for search and rescue. (When a pilot is "shot down" he is vulnerable to being picked up by a helicopter when he lands at Nellis, and being flown back into the desert, where he is dropped at approximately the point where he would have landed by parachute. He and his squadron then have to go through all of the steps in extricating him from hostile territory.)

As in most forms of guided experiential learning, the payoff for the ACMI and the RED FLAG exercises comes in the critique. The ability to capture the action, and to measure with exactness the outcome of each attack, makes the exercise an especially valuable learning experience. Like most forms of modern combat, battle encounters in midair are over in seconds. The human senses simply cannot take it all in fast enough, or comprehensibly enough, to appreciate what happened. A detailed critique permits skilled instructors to build on the fresh experience of participants so as to ingrain the lessons that the exercise should have taught. Conventional air training left participants with fleeting impressions of the mock combat to be argued over at the bar. RED FLAG or ACMI

critique mechanisms provide for mentoring tactics and technique, individualized for each participant, or for teaching teamwork in flights, within squadrons, or among force components. Participants are therefore far more likely to internalize the lessons of the training than with any other form of instruction available to TAC.

TAC has a solid gold asset in Nellis AFB. The base is a large, modern, and well-equipped installation located on the fringes of a city inherently attractive to pilots on three weeks TDY away from home. The Nellis range sprawls to the north and west of the base across an array of mountains and desert that is 100 miles from north to south, and 100 miles from east to west. While certain of this area is dedicated to test activities of the Air Force and other U.S. government agencies, most of the air space, and at least half of the ground is available for training. TAC intends that this facility become the hub of its training in years to come.

The Nellis range area is larger than any of the five smaller states (Rhode Island, Delaware, Connecticut, Hawaii, or Massachusetts). In terms of a comparable area in Virginia, if one were to place Fort Monroe in the southeastern corner of an area identical in extent, the Rapidan River would flow across the range northern boundary past Fredericksburg. Richmond and Petersburg would be in the very center of the range. The western boundary would be out towards Charlottesville. This was an area, of course, that during the Civil War constituted an entire theater of war. Here the Army of the Potomac contested the Army of Northern Virginia in five long years of maneuvers involving half a million men.

Two squadrons can undergo the training at Nellis at any one time. TAC has a total of 34 squadrons, of which 23 actually deploy to Nellis (the other nine participate from home stations). Four Reserve Squadrons also participate yearly. Two hundred fourteen aircraft make up the permanent party that supports Nellis AFB (equivalent of two wings). A breakdown of these aircraft follows:

Number	Type
6	A10
6	F15
103	F111
41	F5
23	T38
29	F4
6	UH-1

Not all of these support the two transient squadrons undergoing RED FLAG training; some are devoted to tests or weapon evaluations.

Including transients, Nellis has supported as much as 550 aircraft during a 30-day period. There is one notable lack at Nellis: an inability to simulate close air support. It is not now possible there to enact a joint Army-Air Force suppression campaign, or a concerted USAF-Army fire and maneuver operation of any sort. The Nellis range does have a simulated FEBA (forward edge of the battle area), but it is static, and requires airborne forward air controllers that TAC regards as unrealistic. Accordingly, TAC expresses hope that the Army can position troops nearby, so that the RED FLAG participants could practice operations in conjunction with Army forces.

An Army RED FLAG?

U.S. Army training is evolving in much the same way that TAC's training management has improved over the years –except that we are five years behind or more. As TAC once managed training with a flying-hour program, until 1975 the Army managed via the Army Training Program (ATP) that prescribed the number of hours per subject to be conducted by each unit annually. As the Air Force moved away from hour management toward event-oriented training and unit designated operational capabilities, so the Army moved to the Army Training Evaluation Program (ARTEP), which prescribes combat tasks, conditions and standards for its units. In addition, we have taken tentative steps toward forming fulltime "aggressor" units, and even instrumented engagement simulation.

Evolution of Training Management

USAF	US Army
Flying Hour Program	Army Training Program (ATP)
Specified Events	Army Training Tests (ATT)
Unit D.O.C.	Army Training Evaluation Program (ARTEP)
Aggressor Squadrons	OPFOR units
Multi-threat Ranges	TEALTRAIN, MILES

The Army has every reason to hasten to emulate TAC. While we do not have extensive historical data that would permit us to quantify the impact of combat experience upon survivability, as does the Air Force, we have long prized battle experience as an indicator of superior professional qualification. Every soldier recognizes the advantages of old campaigners over battle-green troops, of experienced units over un-blooded outfits. Our intelligence officers identify the lack of recent combat experience in the Soviet officer corps, for example, as a weakness. And anyone who fought in Vietnam would attest to a preference to serve under a battle-tested leader.

But is it possible in peacetime to approximate the conditions of combat to the point that training serves as a surrogate for combat

experience? Again, the answer has to be in the affirmative. One year ago the Army collected data from four months of platoon level training in Europe with REALTRAIN. The data incorporates results from four different training areas, and from all maneuver units in USAREUR. REALTRAIN is an engagement simulation, a very crude form of an instrumented range, but it simulates weapon effects in real time. The test design pitted control teams who were trained using the simulation repetitively for each of three weeks against teams who received no more than one week's such training. In the aggregate, the units with three weeks training proved to be significantly more adroit at detecting targets, engaging them first at greater ranges, "killing" more of the opposing force, and suffering fewer "casualties" of their own. In the tables below TEAM A is the better experienced group, TEAM B the lesser experienced; the "battles" were meeting engagements of equal strength, platoon-size, tank-APC (armored personnel carrier) task forces:

INITIAL DETECTION AND INITIAL ENGAGEMENT BY TRAINING WEEK

	Week 1		Week 2		Week 3		Weeks 1, 2, & 3	
	Team A	Team B	Team A	Team B	Team A	Team B	Team A	Team B
Initial Detector	5	5	7	3	5	3	17	11
Initial Engager	6	4	9	1	6	3	21	8

COMPARISON OF SURVIVABILITY FOR WEEKS 1 AND 3

	Percent Casualties				Percent Change	
	Week 1		Week 3		Wk 1 to Wk3	
	Tm A	Tm B	Tm A	Tm B	Tm A	Tm B
Casualties						
Tanks	48	45	36	67	-26	+49
Infantry	34	49.2	30	55	-13	11
APC	60	55.0	35	40	-42	27
TOW	90	90.0	33	44	-64	51

Three weeks of REALTRAIN made Team A participants both more lethal and more survivable:

- 55% increase in first detections
- 163% increase in first engagements
- 26% increase in tank survivability
- 49% increase in tank-killing prowess

Despite the limitations of the REALTRAIN engagement simulation (usable only in daytime, only for cross-reinforced platoons, and only in the confined local training areas in West Germany), it demonstrably provided valuable learning experiences.

The Army possesses, in TRADOC's instrumented range at Fort Rood, a facility that foreshadows the training possibilities of more advanced engagement simulation systems. TCATA (TRADOC Combined Arms Test Activity) recently conducted a test comparing two tank platoon configurations, one of five tanks, the other of three. In this test, TCATA's Weapons Engagement Scoring System (WESS) was used: laser projectors were mounted on main gun tubes, and all participants were equipped with detectors which signaled when hit by a laser "shot". One test was a live-fire battle run, but three of the four subtests were two-sided engagement simulations, in which the platoons under test had to defend both by day and by night against 4:1 odds, and to conduct a daylight attack against 2:1 odds. The following is quoted from the test report:

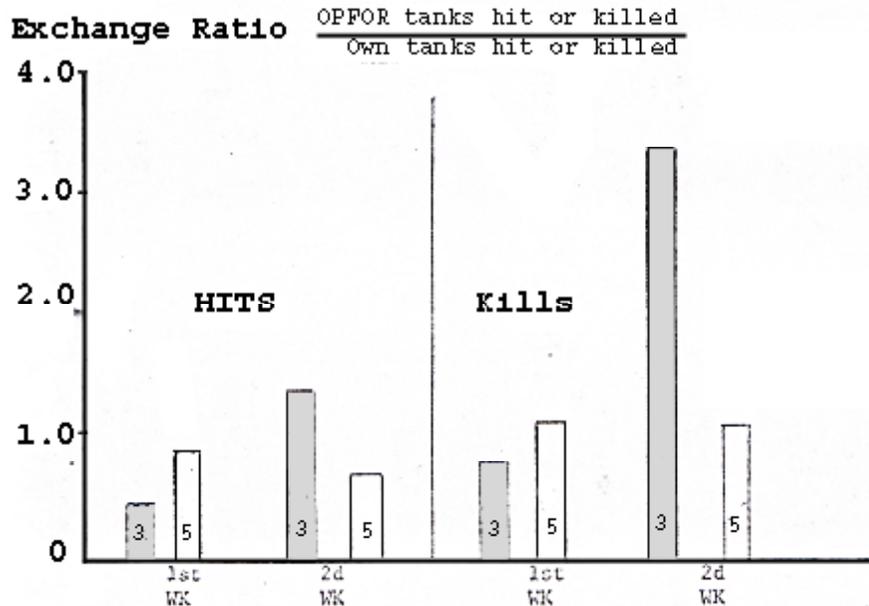
There was a dramatic learning effect from one iteration to the next and overall from one week to the next during non-live fire testing using the Weapons Engagement Scoring System (WESS).

Crews critiqued themselves after each iteration and corrected errors on subsequent iterations. For example, tank crews learned within one or two iterations that the tank must be moved out of position immediately after firing an engagement if they hoped to survive. This improved learning for fighting the platoon was clearly evidenced in test results during the second week. Both platoons began engaging from battle positions using volley-fire. The platoon would be in complete defilade and move forward on order from a dismounted observer. As soon as the volley was fired the platoon's tanks backed into defilade and rapidly moved to a subsequent positions.

Other employment techniques were developed as a result of this learning effect. For example, during the first week the three-tank platoon leader initially attempted to use a single tank to cover the withdrawal of his other two tanks from the initial battle position. This not only compounded his command and control problems, but also did not permit maximum combat power to be brought to bear on the aggressor at any given time. As a result, this stay-behind tank was quickly lost. Similarly, in the five- tank platoon, when a section was left behind to engage a rapidly closing aggressor, that section was usually overwhelmed by the numerically superior aggressor. During the first week, the one stay-behind tank of the three tank platoon was killed four of six iterations, while the five tank platoon lost one or more of the tanks from the stay-behind section over five of six iterations. During the second week, the three tank platoon always moved together and the five tank platoon did not leave the light section behind on the same position...

...(the) two least trained and experienced crews (two of the crews in the five tank platoon did not have the benefit of the first week's work with WESS) were usually observed as being the first killed or lost trying to maneuver to subsequent positions...

The following graph shows this learning process reflected in very significant gains in survivability and lethality for the three tank platoon (that was not weighted down by the less well-trained crews):



The three tank platoon —fighting in a configuration unfamiliar to them from all previous training and experience— showed a five-fold increase in survivability and lethality from the first week to second week! As the TCATA report puts it: "a dramatic improvement in platoon proficiency can be realized by the use of battle runs and instrumented hit/kill exercises" using WESS, laser-based engagement simulation.

But what of combat against Soviet tanks? To assess the impact of training, TRADOC training effectiveness analysts recently completed a computer simulation of a battle in West Germany in which a U.S. tank-infantry task force fought an active defense against a Soviet regiment making a determined breakthrough attack.* The force ratio and Soviet weapon capabilities —speed, accuracy, fire distribution, re-aim and reload times— were all pegged at values provided by DA intelligence analysts. Two levels of U.S. ability were used. In the first iteration the U.S. force was assumed to be capable of using its

* The mathematical model was that employed in both the DRAGON and the MICV cost and effectiveness analyses (COEA).

weapons at the values reported by the Army Materiel Systems Analysis Agency (AMSAA) for hit/kill probabilities, and reload and realm times (AMSAA data presumes well-trained crews). Then the simulation was rerun with the U.S. parameters degraded by 25%, representing a force whose state of training was such that its crews were only 75% effective. The influence of this degraded state of training upon the outcome of the battle was disproportionate. As far as major tank-killing weapons are concerned, the 75% trained U.S. force proved to be 41% less survivable and 31% less lethal than the 100% trained Task Force. The difference is simply that between winning and losing!

OUTCOME

WITH WELL-TRAINED U.S. TASK FORCE

	Soviet	U.S.
Forces Operational	45%	59%

WINS

OUTCOME

WITH U.S. 75% TRAINING EFFECTIVENESS

	Soviet	U.S.
	58%	41%

Loses

Is it possible that U.S. forces would be committed to such a battle in a degraded State of training? Not only possible, but also likely. Tests of tank crews at Fort Hood in 1975 showed that at the close of an intensive gunnery training period, units were capable of shooting at AMSAA expected values. But the same tests also showed that "off-season" engagement times were 100% slower, and accuracy 72% of peak performance—and that is probably typical of most of the Army, year round. Two U.S. Army colonels, both with extensive command experience, recently estimated that:

The root problem is that the average line combat unit in today's Army is sorely pressed, to achieve the very high standards of performance required to win on the modern battlefield. To use a rough estimate, in the average "ready" combat units we have been directly associated with in an extended field training environment in command positions (4 of 16 divisions over the past three years), the level of training and discipline is such that the most complex combat-related tasks will be done 80% well—a level average proficiency which has been gradually rising. With sufficient command attention, a near 100% level, could be attained, but for every area attaining-95 to 100%, the level of performance in another area will probably recede to 60 to 70%. Moreover, training must compete with other programs for leadership time and resources. Indeed, if 100% effectiveness in combat tasks were achieved, it would be at severe expense of a

number of tasks that are critical to peacetime such as morale and welfare...^*

If it is accepted that U.S. troops units need more and better peacetime training, taking full advantage of engagement simulation, how can we provide for it? Surely one answer lies in TAC's RED FLAG model: uproot tactical forces from their garrisons, fly them to a place remote from normal peacetime pursuits, and there put them through an experience as close to combat as modern technology and ingenuity will admit.

Where to Locate an Army RED FLAG

An Army must train as it will fight—and that means it needs maneuver room. Here are areas typical of deployed U.S. Army battalions:

(meters)	<u>Civil War</u>	<u>World War I</u>	<u>World War II</u>	<u>USAREUR Today</u>
Frontage	370	550	900	6000
Depth	550	1200	1650	12000

Since World War I the amount of land occupied by a battalion —about 800 men— has increased by a factor of 10. Whereas World War I divisions, with 27,000 troops, fought on a front of 2 to 6 kilometers, a division in USAREUR today, with 40% less manpower, can expect to fight across a sector 60 kilometers wide. Even accepting compromises with realism, and training only slices of support troops, the minimum required for training the key echelons or today's Army are as follows:

	<u>Frontage</u>	<u>Depth</u>	<u>Acreage</u>
Battalion Task Force	9 km	25 km	56000
Brigade	15 km	25 km	93000
Armored Division	24 km	30 km	180000

There are very few places in the world where U.S. Army troops are stationed proximate to military reservations capable of supporting a divisional exercise.**

Fortunately, two of the Army's largest tracts of range area are located close to Nellis Air Force Base and RED FLAG. The first is Dugway Proving Ground in Utah, which is approximately 250 miles from Nellis AFB. The other is Fort Irwin, California, which is

* Colonels Bradford and Brown, "Implications of the Modern Battlefield," paper prepared for presentation at an Inter-University Seminar on the Armed Forces and Society, Air University, October, 1976.

** Fort Huachuca, Arizona, a third possibility, is more than 300 miles, and Forts Hunter Liggett and Roberts in California are even further.

approximately 100 miles southwest of Nellis AFB, the same radial distance as RED FLAG target areas to the north of Nellis.

Dugway Proving Ground is a DARCOM post comprising some 840,911 acres (1,314 square miles). With the exception of approximately 95,000 acres in the northeastern corner of the reservation, most of the area is on the Great Salt Lake Desert, and consists of barren alkali flats that will not support vehicular traffic because the water table is very close to the surface. Dugway is adjacent to the Wendover-Hill Ranges, which belong to USAF (a sub-post of Hill AFB), and are like Dugway, largely flat salt desert. The useable portion of the 95,000 acres in northeastern Dugway comprises a rectangle approximately 8 km (5 miles) wide by 24 km (15 miles) long, astride the foothills of the Cedar Mountains. Heavily cross compartmented by fingers which run down from the mountains, the area is craggy and cannot be trafficked by vehicles on the east, and gives way to sand dunes and the desert on the west. However, firing in this area on azimuths from 315 degrees through 270 degrees would be virtually unconstrained, since the reservation's boundaries are 30 miles or more distant. Dugway, which has a C-5A capable air field, has much in favor of its use for basic training of tank or APC crews, but its flexibility as a place for combined arms training of larger formations is limited.

Fort Irwin is much more interesting terrain. The post is roughly rectangular, 53km (33 miles) from east to west, and 64 km (40 miles) from north to south. It covers 642,000 acres (1,003 square miles). - That area is as large as the Richmond-Petersburg region where the Army of the Potomac and the Army of Northern Virginia fought the bitter battles of 1864 and 1855. It is bigger than the area that lies among the cities of Washington, Baltimore, and Annapolis. Properly described as high desert, Irwin is barren, rugged ground with plentiful cover and concealment from ground mounted weapons, but little concealment from the air. There is a good deal of relief throughout the reservation -gullied, rolling valley floors, and volcanic rock hills that traverse the post from east to west. These cut the reservation into four compartments, the largest of which halves the post, starting in the northwest and curving around to the east, from the western boundary to the eastern boundary. In this compartment are located the cantonment, most of the ranges, three of five artillery impact areas, and a NASA ground station. The southernmost compartment contains two large artillery impact areas, in the southeastern corner of the post. The northernmost compartment, occupied by a dry lakebed called "Leach Lake," is presently used by the Air Force for bombing practice by aircraft from Nellis AFB. The remaining terrain compartment, in the northeastern quadrant of the post, will be the site of new tank tables 9 and 10, and a mechanized infantry squad assault course. The surface is durable in all seasons;

track vehicles maneuver freely throughout the post, limited only by hills and the impact areas.

Fort Irwin is presently leased by the State of California for the California National Guard. The Guard operates the post, maintaining there several hundred armored vehicles, including more than 200 M48A5 tanks. The post is used principally on Saturday and Sunday each week, when units of the 40th Division are bussed into Irwin, draw armored vehicles, and conduct weekend training (on Saturday and Sunday). There is a small cantonment, with some 4600 barracks spaces (mostly single story temporary buildings), 18 company-size (200 men) dining halls, and one large (1,000 men) consolidated mess hall. Although there is an Army airfield, it cannot handle Air Force troop carrier aircraft. The nearest airhead (C-141, C-5A) is George AFB, 50 miles to the southwest. The nearest railroad siding is 30 miles away, outside of Barstow, California. As a maneuver area, Fort Irwin's principal disadvantages are the five artillery impact areas which, being off-limits for troop movement, fragment the most tactically challenging portion of the terrain. Before one could realistically maneuver battalion task forces or larger formations, it would be necessary to de-dud two or more of these impact areas. The existing firing range infrastructure is outmoded, and is scarcely worth preserving. The reservation would make for expensive vehicular operations (volcanic rock cuts short track-life, dust is hard on engines, cantonment-to-training distances are long). And the State of California will resist its return to Federal management. But despite all of its disadvantages, its advantages are compellingly in favor of the Army's acting to reclaim Fort Irwin for Active Component training, and equipping it to complement the USAF facility at Nellis AFB.

Advanced Training Technology

It appears possible to expand significantly the capabilities of engagement simulation for U.S. Army forces. Firstly, the Army's forthcoming Multiple Integrated Laser Engagement System (MILES) will be able to simulate all the Army's direct fire weapons, both day and night.* Secondly, MILES could be combined with PLRS** (position locating and reporting system), with TOSS*** (automated tactical operations support system), and with TACFIRE*** (automated tactical fire control system) to produce a capability to follow and record, for tutorial/mentoring purposes, maneuver on the ground. Such equipment would also facilitate advanced indirect fire simulation,

* In engineering development by PM TRADE of DARCOM. Expected to be fielded in-1979. More versatile, rugged, smaller, and much cheaper than WESS.

** Under development by PM ARTADS of DARCOM.

*** Under development by PM ARTADS of DARCOM.

casualty assessment and recording, and the logging of personnel and logistical transactions. (The U.S. Marine Corps already has in operation similar instrumentation**** to control ground and air maneuvers at its Twenty Nine Palms Reservation southwest of Fort Irwin.) Thirdly, some combination of MILES and PLRS, plus the sort of instrumentation and simulators that TAC uses in ACMI, should permit portraying the enemy electronic and air defense environments, and working out procedures for combining U.S. Army and U.S. Air Force assets against the high threat that would exist on the forward edge of the enemy's battle area. For example, cooperative suppression, joint helicopter-fighter tactics, and Army designation of targets or control for TAC air strikes, could be acted out. Fourthly, it would be possible to reproduce the offensive EW capability of Soviet-equipped forces so as to challenge thoroughly the electric countermeasures employed by U.S. forces, and to cause them to integrate their own EW with their fire and maneuver.

Much of the sophisticated instrumentation needed is, then, already under development. While we would probably need all the designed capabilities of MILES, the full military characteristics of PLRS, TOSS, or TACFIRE might not be required, and less expensive versions, using commercial components, could be adapted. For instance, restrictions on size, weight, power requirements, climatic protection, and electronic security could readily be waived for training purposes. Because the Fort Irwin area has relatively little cloud cover, solar power applications for fixed instrumentation are practical (wind power is also feasible); expensive power lines and vulnerable cables can be avoided.

Significant developmental work would have to be accomplished for EW, artillery fire marking, and for mine and chemical warfare. But the Fort Irwin facility would present the Army an opportunity to tackle problems of maneuver control and simulation unconstrained, as we have been in the past, by the high cost of procuring the quantities of training equipment needed to equip every installation. Fort Irwin could become the Army's laboratory for advanced training technology.

On the next page is a table setting forth possibilities for instrumentation at Fort Irwin.

**** The USMC Tactical Warfare Assessment and Evaluation System (TWAES), does not incorporate MILES or anything like it, and works best for maneuvers afoot. But TWAES demonstrates that modern technology can handle the complex situations of ground warfare.

**INSTRUMENTATION
FOR FORT IRWIN**

FUNCTION	TECHNOLOGY	STATUS
Simulate direct fire weapons	Modulated (coded) laser	MILES (PM TRADE)
Locate, track participants	Radio Trilateralization	PLRS (PM ARTADS)
Record, display maneuver	Automated displays	TOSS (PM, ARTADS)
Simulate indirect fires	Automated displays	TACFIRE (PM ARTADS)
Live Fire Targets	Laser or millimeter wave radio to pop-up or traversing targets, impact scoring	Commercially available or TASO fabrication
	Polyurethane foam	TASO fabrication
	Hulks	DARCOM depots (e.g., M114)
Measure fuel consumption	Meters on dispensing trucks	CS ³ (PM, ARTADS)
Evaluate parts consumption	Automated recordings	
Measure ammo consumption	Radio transponder from on board acoustic sensors, or MILES counters into automated record	Could be added to MILES (PM, TRADE) and linked to TOSS (PM, ARTADS)
Emulate maneuver of flank units	Computer assisted map maneuver (games)	Commercial or connected to CATTs or CAMMS

Training At Fort Irwin

Equipped as outlined above, we could conduct training at Fort Irwin that might contain four modules:

Module 1: Intelligence. We should collect at Fort Irwin a pool of Soviet-type equipment, and bring together the very best demonstrations of that equipment in use. (Actual, or on television tape, or shown via miniaturized radio-controlled models.)

Module 2: Electronic Warfare. With simulators or actual equipment, we should demonstrate to participants the capabilities of Soviet-type EW gear to locate, to identify, to listen, and to jam U.S. electronic emitters of all sorts. Together with Module 1, Fort Irwin should become the Army's principal school on Soviet-style warfare.

Module 3: Engagement Simulation. Within an overall USAREUR reinforcement scenario, (so that the mission profile and the threat compares closely), and on instrumented ranges, we should pit force-on-force, with strength ratios appropriate for the mission (e.g., three to one on defense, one to three for the attack). Arrangements should be sufficiently flexible to permit exercising at least a battalion, with options to handle forces as large as a division. In all cases, through use of simulations like the Combined Arms Tactical Training Simulator (CATTS) or Combined Arms Map Maneuver System (CAMMS), it should be possible to exercise the headquarters one echelon above that which is actually being played on the ground.

Module 4: Live-fire. Here we might present for ground forces target servicing problems in delay or defense, involving cooperation with attack helicopters and tactical air, against target arrays representing the first and second echelon of a breakthrough attack, with its associated EW. Alternatively, live-fire exercises could be built around the same target array, but involving a limited objective counterattack. Or, with a different target array, an attack could be staged.

We may need a fifth module for attack helicopters, a multi-threat range where they could perform advanced nap-of-the-earth flying, target acquisition, and engagement against realistic target arrays and EW simulators, before they participate in modules three or four.

Obviously, such exercises would be expensive to conduct, and would entail large outlays for troop transportation and support. Use should be reserved for troops fully prepared for advanced training. Training should be intensive, continuous (day and night), and wholly in the field. About 10-20 working days would be required to take advantage of the modules sketched in the foregoing, although key personnel only would be needed at the start and finish (TEWT, issue and turn-in). Assuming therefore that the facility would be used by active forces arriving in relays, the facility ought to be able to handle the brigades of 6 divisions annually, allocating each a 2-3 week period, or providing one division one month. The Active Army will probably have to assure the California National Guard that they will be provided Inactive Duty Training weekends and Annual Training approximating in maydays what they are presently conducting, with the added advantage of being able to use the new instrumented ranges, and other training facilities.

The construction concept should be predicated on austerity, with maximum use of temporary buildings and tactical shelters. The

* Digitized terrain data for Fort Irwin is available from DMA; action is underway to raise its resolution to 12.5 meters horizontally and 1 meter vertically.

implications for permanent facilities at Fort Irwin would be principally a build-up in maintenance capabilities, so as to handle pools of additional combat equipment. Sufficient gear would have to be brought in from war reserve stocks to support at least one brigade's worth of combined arms, per the restructured division TOE. This equipment will have to be instrumented (MILES, transponder, etc.). Participants should draw this equipment from storage, as from one of the storage points in Germany. After use, it should be returned to its "as stored" condition, and turned in for use by a succeeding unit. Providing a second or third brigade's worth of equipment to be used in rotation, or to meet requirements for multi-brigade maneuvers could generate additional flexibility. Two or more sets of equipment would facilitate maintenance, and ease the administration of withdrawal and turn-in.

GENERAL CONCEPT: Fort Irwin, CA becomes the Army's prime armored training ground, its Combined Arms Training Center. Other than OPFOR, no troop units are stationed there, but are flown in to exercise strategic mobility. Equipment pre-positioned there, and specially instrumented for controlled, recorded, and critiqued engagement simulation, is used vice organic equipment. Equipment like PLRS, TOSS, and TACFIRE contributes. TAC participation as part of RED FLAG is solicited, or Army participation in RED FLAG at Irwin is requested.

TRAINING GROUPS: 1. Brigade plus DS Arty Bn (preferred) or Maneuver Bn TF plus DS Arty Btry plus Brigade Hq Co or Division
2. Adv Course Officers, NCOs
3. M1CV crewmen, tankers

TIMING: 1. TRADOC participants, late in course, as capstone.
2. Others linked to command but, with objective of providing 05-06 e-experience early in command, so as to allow ample time to address training deficiencies discovered, and to yield maximum readiness payoff.

While participating troop units would obviously come from the armored and mechanized divisions of FORSCOM and Seventh Army, TRADOC also needs Fort Irwin urgently. Institutional training for officers and enlisted men who must man our armor and mechanized units is severely limited on available land at Fort Knox and Fort Benning, where such training has traditionally taken place. Officers and NCOs in TRADOC service schools' might be flown in to Fort Irwin to shoot, and to

* Officer Advance Courses, Officer Basic Courses, Advance NCO and Master Gunner Courses

serve as controllers for the maneuvers. Assuming the instrumented range took most of the judgment away from the controller function, and confined his contribution to that of keeping participants honest, resetting MILES equipment on casualties, and otherwise insuring smooth operation of the simulation, these young leaders could thereby be afforded a unique opportunity to watch an actual force in the field coping with advanced tactical problems.

Whether Fort Irwin should be a FORSCOM or TRADOC post is not critical, but there are cogent reasons for assigning the Fort Irwin mission to TRADOC, or at least assuring a strong TRADOC presence:

1. TAC learned early in its Nellis experience that to the degree that ACMI or RED FLAG were considered as operational readiness tests, to that degree their training value was attenuated. Commanders tended to use "safe," wooden tactics, and pilots followed suit. Everybody paid more attention to doing the "right thing," than reacting to the threat and learning. TAC holds that the Nellis experience should be considered training, and only training, if full return on investment is to be realized. Accordingly, having TRADOC rather than FORSCOM ^ run the post would diminish the ORTT threat.

2. The post ought to serve USAREUR as well as FORSCOM. What the Army needs to ease training land pressures in USAREUR and improve Seventh Army's training is a "reverse reforging" - strategic deployment exercises that lift Seventh Army units to Irwin as well as FORSCOM units to Germany. Having TRADOC operate the post may facilitate relations with the two other MACOM principal users.

3. TRADOC could collect high density data from ordinary, day-to-day troop operations that would shed light on tactical concepts, organizations, weapons systems, and tactics as well as training. If we are careful to establish automated procedures for collecting such data, analyzing and retrieving same, we ought to be able to learn a great deal about the Army that we cannot now know. Every round fired at Fort Irwin should provide stochastic data to help us build our equivalent of the AMSAA curves. Every maintenance deficiency, every part supplied, could amplify information available to DARCOM and TRADOC to estimate training deficiencies and materiel shortcomings.

4. The instrumented range and the related critique equipment should be considered a test bed for developing training techniques that can be exported to the division posts. TAC has discovered that base commanders are now building ranges like those at Nellis so that pilots can train at home station under

the conditions found to be efficacious in RED FLAG. TAC has under consideration another ACMI at Eglin AFB, and the Army ought to consider a second facility like Fort Irwin in the northeast, close to the Canadian border, for NATO maneuvers on more Europe-like terrain. We should view Fort Irwin as a test bed to learn how to train with advanced techniques, using technology that can then be made available for broader use throughout the Army. For example, we ought to be able to learn at Fort Irwin improved maneuver control techniques which would enhance the value of traditional maneuvers such as REFORGER. Moreover, we ought to be able to devise instrumentation packages that would increase the usefulness of severely constrained training areas like Grafenwöhr and Hohenfels.

5. Close cooperation at Fort Irwin with TAC in the actual employment of air and ground units together offers the best opportunity for working out joint procedures that will stand up in combat. Rather than seeking to write a commonly agreed doctrine, we would simply join RED FLAG, then go out and find out how to cooperate with the Air Force to designate targets with laser, to bomb by beacon or radar or close support, to control air strikes from tanks or scout helicopters, to conduct joint anti-aircraft and ECM operations, and to plan such operations as we will have to plan them in battle.

6. TRADOC professional instructors should critique participants against latest doctrine and intelligence appraisals. Irwin could become a mechanism for introducing new material and organizations, new concepts, tactics, and training techniques to the entire Army.

7. Irwin should be a learning experience, not an evaluation of readiness. It will be a school for units, an institution with a curriculum and a faculty. TRADOC is best positioned to create and to supervise such training, and to insure that lessons learned become part of the Army's consensus on how to fight. All of that is TRADOC's sphere, its responsibility for embedding doctrine in the U. S. Army, infusing it into the force, teaching it in our schools, and otherwise insuring that what is learned at Nellis and Fort Irwin becomes the property not of one MACOM, but of the entire Army.

DA should direct TRADOC to prepare, in coordination with FORSCOM and USAREUR, a plan suitable for PARR submission.