Historical Review of the Causes of Fratricide

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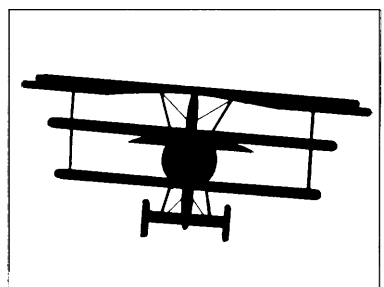
On November 12, 1758, during the French and Indian War, Colonel George Washington of the British Army led a detachment of infantry to take a hill near Loyall Hannon (now Loyalhanna), Pennsylvania occupied by French soldiers and their Indian scouts. The French fled after a brief exchange of fire. But hearing the firing, a second detachment—under the command of Lt. Colonel George Mercer—approached the hill to assist. They arrived at dusk and the day was foggy, making visibility poor. Each side seems to have mistaken the other for French and an intense fire fight broke out, killing between 13 and 40.[1]

While the current high interest in combat fratricide is a direct result of U.S. experience in the Persian Gulf War, this tale shows clearly that fratricide is not a new problem. During the Persian Gulf War, incidents of fratricide received considerable press attention and caused international political friction.[2] There was bewilderment among the public and press about how fratricide could occur. After all, shouldn't it be *obvious* who are friends and who are foes? In addition, to some the losses from friendly fire seem less acceptable as an inevitable cost of war than are losses from enemy fire.[3]



[1] The Papers of George Washington, Colonial Series, vol. 6, W.W. Abbot, ed. (Charlottesville, VA: University Press of Virginia, 1988), pp. 120-123. A "detachment" could consist of between 200 and a thousand infantry.

[2] Just a sample of the popular press stories about friendly fire includes: Bruce van Voorst, "They Didn't Have to Die," Time, Aug. 26, 1991, p. 20; Joshua Hammer, "Risking Friendly Fire," *Newsweek*, Mar. 4, 1991, p. 33; David HackWorth, "Killed by Their Comrades," Newsweek, Nov. 18, 1991, pp. 45-46; Glenn Frankel, "In Britain, Fallout from Friendly Fire," *Washington Post*, May 18, 1992, p. D1; and David Morrison, "Foes Not the Only Threat in the Gulf War," *National Journal*, Feb. 9, 1991, pp. 335-336.

[3] Sensitive to the possibility of a different reaction to friendly fire losses, the Marine Corps readily admitted occurrences of friendly fire but was reluctant to identify precisely which deaths it caused. For example, a Marine Corps spokesman, Lt. Col. Ron Stokes, was reported as saying: "We don't want to start painting guys with a different brush-these guys were killed by the enemy and these guys by friendly fire. They were all killed in a combat action. If you start breaking it down, we're not certain that it benefits either the public or the families. See, "Kitled by Friend or Foe, It's All the Same," *The* New *York Times*, Feb. 14, 1991, p. B18.

The fratricide of the Persian Gulf War was unusual in some regards compared to that of past wars. Most striking was the apparently unprecedented high fraction of U.S. casualties resulting from fratricide; this was due in large part, of course, to the extremely low U.S. casualties inflicted by the enemy.

In addition, the *types* of fratricide were different from other large mechanized land battles, such as those of World War II. In World War II, the most deadly reported individual incidents of fratricide were the result of bombing of friendly troops by friendly aircraft. Surface-to-surface fratricide resulted most often from indirect-fire weapons, that is, artillery fired at a target that the crews could not see. The Persian Gulf War had an unusually high fraction of fratricides from direct-fire weapons—for example, tanks-shooting mistakenly at other land targets, which they could see but misidentified.

This chapter, a historical review of fratricide, shows how serious a problem fratricide has been in past wars and reveals patterns in the occurrence of fratricide in past wars that might suggest lessons for the future.

There are difficulties with a historical approach. The movements of armies are usually well recorded, but the record of particular actions by front line soldiers that might lead to fratricide is spottier and less reliable. Thus, many casualties due to fratricide are never realized to be such, and many that are recognized as fratricide are probably never recorded as such. Within the military historical record, the record of fratricide is particularly suspect because fratricide is a mistake and a full airing can be embarrassing or traumatic and can end careers.

Recording of fratricide has not been uniform. Casualty report forms, for example, have not included fratricide as a cause. Thus, fratricides during the Vietnam War were cataloged under either ''accidental self-destruction" or "misadventure.

Colonel Washington's unfortunate "misadventure" illustrates these problems well. After the Loyalhanna incident, Washington was criticized by some of his officers for losing his customary aplomb under fire, for which he was justly famous. What responsibility he felt after the action we can never know, but he made no mention of the circumstance of his casualties in the next day's reports to his superior officers. In fact, he never mentioned the event in any of his writings until almost 30 years later when, in marginal comments on a draft of his own biography, he related a version in which Colonel Mercer clearly fires the first shot.

The historical record does provide lessons. Many of the cases of fratricide include human errors, not just technical or tactical specifics. Because people change more slowly than machines, history probably provides some useful lessons for today.

Very few works are devoted specifically to fratricide. One particular case of fratricide is probably the most famous because a popular book was written about it, *Friendly Fire*, by C.D.B. Bryan (also serialized in the New *Yorker* and the subject of a television series);[4] this work deals primarily with a victim's family and its dealings with the U.S. Government. Lt. Colonel Charles Schrader's paper, *Amicicide,* contains far and away the largest collection of historical ancedotes of fratricide of any single source and it is cited widely in this chapter.[5] OTA also contracted for two papers on fratricide and they are used freely in this chapter.[6]

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[4] Courtlandt Dixon Barnes Bryan, *Friendly Fire (New* York, NY: Putnam, 1976).

[5] Charles Schrader, *Amicicide: The Problem of Friendly Fire in Modern War (Fort* Leavenworth, KS: U.S. Army Command and General Staff College, 1982).

[6] Richard R. Muller, "Fratricide and Aerial Warfare: An Historical Overview" and John C. Lonnquest and W. Blair Hayworth, Jr., ''OTA Fratricide Study."

This chapter is organized not by chronology but rather by the lessons important to finding technical and procedural solutions to the problem of fratricide. This approach is necessarily somewhat arbitrary since fratricide almost always results from a complex and confused chain of mistakes, making strict categorization impossible. (A gunner may aim toward a friendly target because he is disoriented but certainly will not pull the trigger unless he *also* fails to identify the target properly. Is the fratricide then due to his disorientation or his failure in identification?)

The chapter concentrates on, but does not restrict itself to, American experience. This should not, of course, imply that the U.S. military has a particularly serious problem with fratricide; even a quick glance at military history shows that every army that has fired a shot has had to take into consideration hitting one of their own, or else quickly learn hard lessons. Following the historical anecdotes are some data from the National Training Center—an instrumented, automated facility for combat manuevers--and finally a synopsis of the Persian Gulf incidents.

TYPES OF FRATRICIDE

There are no universally accepted definitions of friendly fire' or ''fratricide. The broadest—and older-definitions include any case in which anyone is hurt by a weapon from his own side other than his own. Thus, if an artillery round is faulty and falls short on friendly forces, that is friendly free; but if it is faulty and blows up in the breech and kills the artilleryman pulling the lanyard, that is an accident. More recently, the military has adopted definitions that exclude pure accidents and grossly malfunctioning equipment. The narrowest definition would include only *willful,* but mistaken, attacks on friendly forces. The current Army Training and Doctrine Command (TRADOC) definition is: ''The act of firing on friendly personnel or equipment, believing that you are engaging the enemy. '

This report uses a definition that excludes *purely* mechanical malfunctions but includes all other cases of friendly personnel receiving fire from weapons operated by other friendly personnel. Perhaps surprisingly, the material difference between the definitions is not great since few fratricide result *solely* from equipment failure.

Fratricides Due to Accidents

Malfunctions always occur, of course, and when dealing with weapons, they can be deadly. For example, in 1968, an F-4 flying to support troops engaged near Ban Me Thout, Vietnam, dropped a napalm canister on a church, killing 13 civilians. The cause was determined to be simply a faulty bomb rack.[8]

More often, however, malfunctions are just part of a chain of errors, sometimes compounded by human actions. For example, in World War 11, the lead bomber of a group would determine the target and all others in the group would release upon seeing the leader's release. During the attack on the Abbey of Monte Cassino in March 1944, a bomb rack malfunction resulted in the premature release by a lead bomber, which resulted in its and others' bombs being dropped on friendly positions. Similarly, on July 24 of that year, during the preparation for the breakout toward St. Lo, when the bomb rack on one lead bomber prematurely released, the other 15 bombers in the group immediately released their loads; unfortu-

[7] Briefing entitled, ''TRADOC Fratricide Study" (undated but received 1992). Note that, in practice, the Army does not always stick with this very strict definition, For example, some of the incidents from the Persian Gulf would have to be called "accidents" if using this narrow definition,

[8] Schrader, op. cit., footnote 5, p. 55.

nately they landed on the U.S. 30th Infantry Division, killing 25 and wounding 131.[9]

Ever since World War I, cases of rear gunners damaging their own aircraft have been common and continue to the present. Helicopter gunships are equipped with traverse-limiting rods that prevent the side-door machine-guns from swinging so far to either side that rounds could hit the helicopter. When such a rod broke on one helicopter during the Vietnam War, the gunner in the heat of battle tracked a target so far forward that he fired into the cockpit and wounded the pilot.

Even when weapons operate properly, unfortunate circumstances can cause what, in the broadest sense at least, might be classed as fratricide rather than accident. In the early morning hours of 5 November 1942 during the second Battle of Guadalcanal, the destroyer *Walke* was hit by Japanese naval guns and torpedoes. With the burning destroyer clearly sinking just a few minutes after being hit, the battleship *Washington* passed close by and launched life rafts for the *Walke's crew.* However, when the destroyer went down soon after, the depth charges on its hull exploded—just as they were designed to when reaching a certain depth-killing many of the crew in the water above.[10]

Some accidents due to human error could be avoided by different equipment design. A U.S. bomber in World War H bombed an air base of the U.S. Ninth Tactical Air Force after the bomber was hit accidentally by a packet of chaff; the surprise caused the bombardier to hit mistakenly the bomb release switch.[11] During the Vietnam War, an F-100 attacking a North Vietnamese Army Headquarters instead dropped bombs over a kilometer short on U.S. troops when the pilot hit the bomb release while trying to adjust the aircraft's trim button.[12]

Fratricide Due to Command and Control Failures

Failure of command and control is a far more common cause of fratricide than simple failure of equipment. Command and control includes telling units where to be, having units know where they are, and keeping units properly informed of the locations of neighbors.

The nighttime Battle of Cape Esperance began late on the night of October 11, 1942, with the destroyer *Duncan* breaking away from her group and charging off in total darkness toward a formidable Japanese fleet. The *Duncan* closed on a Japanese cruiser and opened fire. The crews of the American cruisers, seeing gun flashes very near known Japanese cruisers, assumed that the flashes came from a Japanese ship and attacked with eight inch guns. The flashes stopped almost immediately. Very likely the target had been the hapless *Duncan,* which was in flames, unable to free, and sinking within ten minutes of leaving its group. (Misidentification had been her downfall but it might also have saved her from further attack. During the Japanese retreat, the Japanese apparently *also* assumed that the ship within their midst was Japanese and did not attack, although heavy cruisers passing very close by could have disintegrated the little destroyer with a single salvo.[13])

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9 Robert H. George, ''The Battle of France," in *The Army Air Forces in World War II, Volume Three, Europe: Argument to V-E Day, January 1944 to May 1945,* Wesley Frank Craven and James Lea Cate, eds. (Washington, DC: U.S. Government Printing Office, 1983), pp. 228-277.

10 This repeated a similar tragedy of a week earlier when the destroyer *Laffey* sank and her depth charges killed several of those few crew members that were able to abandon ship. C.W. Kilpatrick, *The Naval Night Battles in the Solomons* (Pompano Beach, FL: Exposition Press of Florida, 1987), pp. 91, 118, and 121.

11 Army Air Forces, op. cit., footnote 9, p. 230.

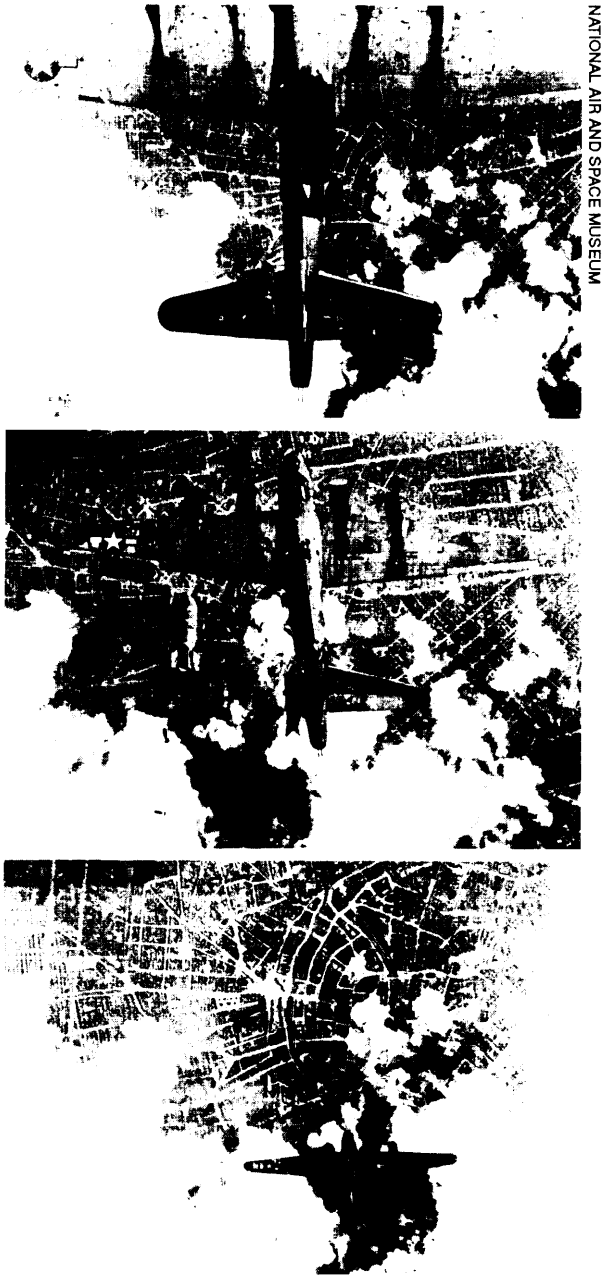
12 Schrader, op. cit., footnote 5, p. 58.

13 Kilpatrick, op. cit., footnote 10, pp. 52-64.

The occasional misplaced shot is bad enough, but worse fratricide can occur when two friendly units start exchanging fire. One unit fires by mistake and the other unit-assuming fire to be a positive identification of enemy—returns fire. On August 8, 1944 during the fighting on Guam, two battalions of the 77th Infantry Division got into a prolonged fire fight. The exchange might have started as each side fried off several mortar rounds to calibrate the weapons' emplacement positions before settling down for the night. Rounds from each side fell near the other; both assumed that it was Japanese fire and thus returned fire with small arms and more mortars. This firing, of course, made it obvious to each unit that the other was enemy and then the accompanying tanks got involved. A real firefight was under way. Finally, their mistake became apparent, in part when each battalion called up the same artillery battalion to request that artillery fire be directed at the other.

A similar exchange became one of the worst cases of fratricide in the Vietnam War. One artillery unit aimed its guns correctly but used the wrong powder charge so the rounds went too far and landed on another U.S. artillery position. The second position responded with deadly accurate counterbattery fire. This duel went on for over 20 minutes and resulted in 90 casualties, all from friendly fire.[14]

Command and control procedures can prevent fratricide when identification is difficult. From the time that aircraft were first used for ground support in World War I, airmen knew that identification of ground units would be difficult. General William ''Billy' Mitchell said, "Our pilots had to fly right down and almost shake hands with the infantry on the ground to find out where they were. '[15] To avoid fratricide, both of infantry and pilots, World War I military com-



NATIONAL AIR AND SPACE MUSEUM

B-17s of Eighth Army Air Force bombing Berlin in 1944. One plane strays beneath another and has its tail clipped by falling bombs. Even perfect identification of friends will not eliminate all fratricide.

14 Schrader, op. cit., footnote 5, p. 21.

15 Richard Hallion *Strike From the Sky: The History of Battlefield Air Attack, 1911-1945* (Washington, DC: Smithsonian Institution Press, 1989), p. 39.

manders divided up combat areas into ''no-fwe" zones and "free-fire" zones.[16]

At the outbreak of World War II, the Germans had the best developed system for air-ground coordination. They began with a World War I system of colored panels to mark infantry positions. This worked well in the attacks on Poland until Polish defenses broke and the German army began a war of maneuver. The German 10th Panzer Division then reported 'constant" attacks by friendly airplanes.[17] The same story was repeated on the Western front, the Germans introduced a system of safety lines *(Sicherheitslinie)* to avoid attacks on their own troops,[18] which worked well at first but, again, once a war of maneuver began deep in French territory, fratricidal attacks increased sharply.

Clearly, in both cases above the change was not in the ability to identify; German pilots did not suddenly forget how to identify tanks that they could have identified the day before. Rather, identification had been difficult all along and operational command and control procedures, developed to serve *in lieu* of identification, broke down when the character of the fighting changed.

Recognizing the importance of rapid maneuver, and the strain it placed on any operational measures to avoid fratricide, the Germans worked diligently to develop better ground-to-air signaling and training programs to increase pilots' identification skills.

The single most famous case of fratricide illustrates the extreme difficulty of coordinating a complex attack by hundreds of elements, even along a stationary front. The carpet bombing in preparation for the Normandy breakout near St. Lo was filled with problems, with those precipitated by mechanical failure of a bomb rack cited above being just the beginning.

World War II classroom instruction in aircraft identification using resin models.

German defenses around the Allied armies in Normandy were tenacious but spread thin. Allied commanders decided that a single, concentrated blow would breach the defenses, allowing Allied armor to pour through the gap. The plan to puncture the defenses was called Operation COBRA. The first phase of the breakout was to be a carpet bombing of German positions. The attack was to start with 380 medium bombers hitting specific targets, followed by over 1,500 heavy bombers, B-17s and B-24s, dropping over 3,300 tons of bombs, with over 500 fighter-bombers and dive-bombers attacking anything that survived. For three hours, the sky would be filled with airplanes.[19]

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16 Maurer Maurer, ed., *The United States Air Service in World War I, Vol. II* (Washington, DC: Office of Air Force History, 1978), p. 373.

17 Williamson Murray, "The Luftwaffe Experience, 193941, '' in B.F. Cooling, cd., *Case Studies in the History of Close Air Support* (Washington DC: Office of Air Force History, 1990), pp. 85-86.

18 Genkdo. XIX. Armeekorps. Ia, Anlagenheft Z. KTB Nr 2, ''Zusamrnenarbeit mit der Luftwaffe, ' National Archives and Records Administration Washington (NARA) T3 14/615/372-393.

19 These numbers come from Craven and Cate, op. cit., footnote 9, p. 232. Most of the narrative is taken from Martin' Blumenson, *Breakout and Pursuit* (Washington, DC: Department of the Army, Office of the Chief of Military History, 1961), pp. 228-239. Part of the problem with a historical review of fratricide can be seen by a comparison of these two "official" histories, one by the Air Force, the other by the Army. The Army was on the receiving end and their history relates much of the controversy between the air and ground commands, while the Air Force history states somewhat matter-of-factly that ''Technically viewed, the bombing was good. " (p. 233)

The attack was delayed a week by weather, Then the July 24, 1944 attack was partially underway when it, too, was called off because of low visibility. (But not before the inauspicious short bombing described above.) Finally, the main attack took place on July 25.

General Omar Bradley thought that the benefit of the bombing would be greatest if the infantry attack could follow immediately after. He wanted ground forces as close as 800 yards even though the air commanders warned that 3,000 yards was the closest safe distance. They compromised at 1,450 yards.

Bradley and other ground commanders had insisted that the bombers approach parallel to the front, so that any ''short' bombing would result in bombing the wrong Germans, not in bombing the wrong side. The air commanders argued that this made their machines too vulnerable to antiaircraft fire. Bradley seems to have believed that he had agreement when he left the last planning meeting. Years later he insisted that "the Air Force brass simply lied" about the direction of the attack.[20]

With so many aircraft, mistakes were inevitable, Visibility was poor. Heavies were to bomb from 15,000 feet but a layer of clouds forced many down to 12,000 feet, which in turn forced groups to reassemble in crowded skies and bombardiers to recalculate bombing solutions in flight. Allied positions were marked with smoke, which was hard to see in the haze and essentially useless once the bombing started, since the bomb explosions raised mountains of dust that mixed with the smoke.

Human error was the cause of most of the short bombings. Mistakes were disastrous when committed by the lead plane of a group because command and control procedures called for the lead plane to sight the target and all other planes to release when the leader did. One lead plane had a broken bomb sight and released visually. Another bombardier thought he was on target but was orienting on the wrong landmarks.

Succeeding flights of bombers would almost never be able to see their targets because of the dust raised by first salvos. Therefore, their attempts to bomb targets were really the bombing of dust clouds, under which they hoped the bombs would find targets on their own.

Unfortunately, in this case, wind blew the dust toward U.S. positions and every wave of bombers struck a little closer. The war correspondent Ernie Pyle wrote later:

> As we watched there crept into our consciousness a realization that windows of exploding bombs were easing back towards us, flight by flight, instead of gradually easing forward, as the plan called for. Then we were horrified by the suspicion that these machines, high in the sky and completely detached from us, were aiming their bombs at the smokeline on the ground, and a gentle breeze was drifting the smokeline back over us! An indescribable kind of panic comes over you at such times. We stood tensed in muscle

NATIONAL ARCHIVES

Soldiers of the U.S. 30th Infantry Division dig out after being bombed near St. Lo by the U.S. Eighth Army Air Force.

20 Hallion, op. cit., footnote 15, p. 211.

> and frozen in intellect, watching each flight approach and pass over us, feeling trapped and completely helpless.[21]

A company commander wrote,

> The dive bombers came in beautifully and dropped their bombs right where they belonged. Then the first group of heavies dropped them in the draw several hundred yards in front of us. . . The next wave came in closer, the next still closer. The dust cloud was drifting back toward us. Then they came right on top of us. We put on all the orange smoke we had but I don't think it did any good, they could not have seen it through the dust. ..22

The results of the misplaced bombing were deadly. Added to the casualties of the abortive attack on the 24th, the short bombings on July 25 caused official casualties of 490 wounded and 111 dead.[23] In addition, the 30th Infantry Division alone reported over 160 casualties due to "combat fatigue, " that is, soldiers simply stunned by the experience but not necessarily showing any bodily damage.

Among the dead was Lieutenant General Leslie McNair, Commanding General of the Army Ground Forces, pro tern commander of the 1st U.S. Army Group, and a strong supporter of air-ground combined operations. He had come to the forward area on the 25th specifically to help morale after the short bombings of the 24th.[24] He was killed instantly and could be identified only by his West Point ring.[25]

The bombings at St. Lo caused resentment between air and ground commanders. The commander of the 30th Infantry Division said, 'Theres no excuse, simply no excuse at all. I wish I could show some of those air boys, decorated with everything a man can be decorated with, some of our casualty clearing stations."[26] General Dwight D. Eisenhower reportedly swore never to use heavy bombers in combat support again, but their usefulness was too apparent and the ban did not last.

On the positive side, Operation COBRA also motivated important U.S. improvements in command and control of bomber groups and in procedures for marking of friendly lines on the ground. During Operation QUEEN, the Allied attempt to breach the Roer River, a carpet bombing preparation like that for Operation COBRA was to open the way for the infantry. This time giant fluorescent cloth panels marked the positions of friendly troops and tethered balloons flew parallel to the front line. U.S. troops also marked their positions by using their *90* millimeter antiaircraft cannon to fire red smoke shells straight up, and the bombing went well.[27]

Repeating the earlier German experience, however, the Allies found that these command and control procedures-depending on careful marking—broke down as soon as a war of maneuver began.

In operations near Cherbourg, a single British division, the 51st Highland, on a single day, August 18, *1944*, reported 40 separate attacks by friendly aircraft (more than occurred during the entire Persian Gulf War).[28]

On August 7, 1944 during OperationTOTALIZE—a franticly paced and fluid attempt to cut off a

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21 Cited in, Max Hastings, over/oral: *D-Day, June 6, 1944* (New York, NY: Simon and Schuster, 1984), p. 254.

22 Blumenson, op. cit., footnote 19, P. 237.

23 Ibid., p. 236.

24 Robert L. Hewitt, *Work Horse of the Western Front: The Story of the 30th Infantry Division* (Washington, DC: Infantry Journal Press, 1946), p. 37.

25 Russell Weigley, *Eisenhower's Lieutenants* (Bloomington, IN: Indiana University press, 1981), p. 170.

26 Hastings, op. cit., footnote 21, p. 255.

27 Kent Roberts Greenfield, "Army Ground Forces and Air-Ground Battle Team, " Study No. 35 (Historical Section: Army Ground Forces, 1948), p. 89.

28 Hasting, op. cit., footnote 21, p. 303.

huge German force fleeing through Falaise--U.S. heavy bombers bombed short, causing 300 casualties among British, Canadian, and Polish ground forces.

A week later, British bombers attacked U.S. Army forces. The primary culprit was a failure of inter-allied coordination. U.S. Army units used yellow smoke to mark their positions while the Royal Air Force used yellow smoke to mark its targets. A historian records one witness saying, " . . . the more the troops burnt yellow flares to show their position the more the errant aircraft bombed them."[29]

Sometimes failures of communication have forced gunners to fire on forces knowing full well that they are friendly. By the very strictest definition--that is, willful but *mistaken* attacks on friendly forces—this would not be friendly fire. The German general Guderian recounts how, during the blitzkrieg into France, Luftwaffe airplanes attacked his units. The ground units knew that the airplanes were German but were forced to return fire in simple self-defense. One pilot bailed out when flak hit his plane and Guderian himself was waiting for him on the ground.[30]

General Omar Bradley recalls that a flight of American A-36s attacked his armored column in Sicily. The tankers properly identified the aircraft as friendly and lit off yellow smoke flares, the markers for ''friendly' armor, but the attacks continued so the tanks returned fire and downed one of the planes, When the pilot parachuted to earth, the tank commander said, ''Why you silly sonuvabitch, didn't you see our yellow recognition signals?" To which the pilot replied, "Oh. . . is that what it was? '[31]

On August 15, during the breakout from Normandy, one American fighter pilot had the bad luck to mistakenly strafe the headquarters of the XIX Tactical Air Command near Laval. Antiaircraft gunners knew full well that the plane was American but again for self-defense were forced to return fire. Flak brought him down.[32]

Fratricide Due to Fire Discipline Failures

At the lowest level, ''command and control' devolves into something as straightforward as "fire discipline.' Indeed, where command and control concerns the actions of units, fire discipline concerns the actions of the individual shooter.

The following case illustrates a string of mistakes, fire discipline being just one: In the fighting in France, a group of eight tanks set out in low visibility in late afternoon of July 9, 1944. They were under strong pressure from superiors to make a symbolic advance by the end of the day. At a critical road junction, the group commander turned right instead of left, bringing them upon Company C of the 823 Tank Destroyer Battalion, later to hold a U.S. record for most German vehicles killed.

Based on the tactical situation, the company expected no U.S. tanks to be on that road and the tanks were approaching from the direction of German lines; thus the company reasonably assumed that they were German. The first tank took a direct hit from a 76 millimeter antitank cannon and was destroyed. The others continued to advance and opened fire. At 400 yards, the defenders recognized the tanks as American. One very brave sergeant stood up and waved wildly to get the tanks to stop firing but they kept on. The defenders stopped firing, took cover, and hoped for the best. One of the passing tanks shot at an uncamouflaged halftrack at a range of 15 yards, wounding a driver.[33] This incident shows that

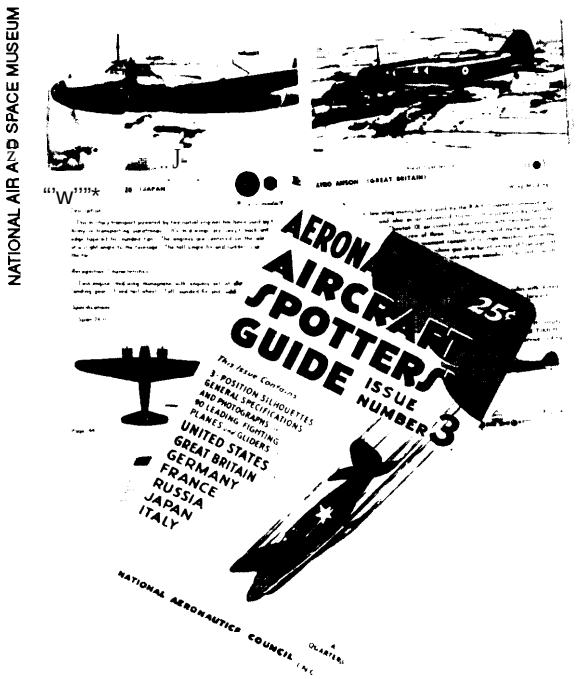
[29] John Terraine, *A Time for Courage: The RAF in the European War, 1939-1945 (New* York, NY: Macmillan, 1985), p. 661.

[30] Heinz Guderian, *Panzer Leader (New* York, NY: Dutton, 1952), p. 113.

[31] Hallion, op. cit., footnote 15, p. 178.

[32] Craven and Cate, op. cit., footnote 9, vol. III, p. 255.

[33] Schrader, op. cit., footnote 5, p. 82.



Aircraft Spotters' Guides distributed to troops in the field during World War II. The most basic identification system is comprised of the human eye and the human brain, but these require training to be effective.

fratricide occurs because of compounded errors; in this case, starting with poor navigation, poor communication, and faulty identification, and ending with lack of fire discipline, since inability to identify can hardly justify firing at a halftrack at 15 yards.

Lack of fire discipline was the major contributor to the worst antiaircraft fratricide in World War II. On July 11, 1943, the beachhead on Sicily was to be reinforced with a drop of 2,000 paratroops. The troops left Tunisia in 144 C-47 transports. The fleets and ground forces had been alerted to the drop. The flight went well until, when crossing over the coast at a very visible but vulnerable altitude of 1,000 feet, the transports were fired on by a lone machine-gunner. The beachhead forces had been attacked just hours earlier by German bombers and, once the firing started, discipline collapsed; everyone on the ground was 'throwing everything they had at us' as one airborne company commander later put it. A destroyer even fired on transports that had ditched at sea. The results were a disaster. Of the 144 transports, 23 were shot down and 37 damaged. One hundred forty one paratroops and air crewmen were killed. Many of the transports that survived did so by scattering; thus, of the original force of 2,000, only 500 or so could be effectively organized on the ground in the drop zone.[34]

Just two days later, the British suffered a similar incident in their zone of Sicily. Nineteen hundred paratroops were to capture the Primosole bridge, but more than half the transports were hit by either ship- or ground-based antiaircraft fire. Three hundred men did reach and capture the bridge.[35]

Fratricide Due to Navigation Failures

Closely related to command and control are the problems of navigation. During World War II Pacific fighting and in Vietnam, many artillery fratricides resulted from forward observers correctly calling in fire *relative to their putative positions,* but not knowing their own locations precisely.[36] This seems characteristic of jungle fighting, when forces could go long periods without knowing just where they were. The Marine Corp still refers to "The Battle of the Tenaru River' (on Guam), which actually took place on the Ilu River, but because the maps were so poor and the vegetation so thick, the men on the ground did not know that at the time.[37]

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34 Carlo D'Este, *Bitter Victory: The Battle for Siciliy, July-August 1943* (New York, NY: William Collins, 1988), pp. 307-308.

35 Albert Garland and Howard Smyth, *Sicily and the Surrender of Italy* (Washington, DC: Us. Army, Office of the Chief of Military History, 1965), p. 218.

36 Schrader, op. cit., footnote 5, p. 23.

37 Adrian Stewart, *Guadalcanal: World War II's Fiercest Naval Campaign* (@redo% England: William Kimber, 1985), p. 50.

Navigation, not identification, clearly was the problem when Navy dive-bombers were called in to attack Japanese defenders on the tiny island of Tanambogo. The planes bombed *the wrong island,* adjacent Gavutu, killing three Marines and wounding nine others.

Navigational blunder was responsible for mistaken aerial bombing of civilians in World War II. One of the earliest incidents was a German error. On May 10, 1940, 20 Heinkel 111s set off to bomb Dijon. One Luftwaffe lieutenant got separated from the group due to bad weather. When a city suddenly appeared below, he took it to be Dijon and bombed it but it turned out to be the German town of Freiburg. (Instantly, the Ministry of Propaganda announced that Allied aircraft had initiated a deliberate policy of 'terror bombing, ' with the innocent citizens of Freiburg as the frost victims.)38 In general, however, these sorts of gross navigational error rarely caused fratricide in World War II.

A World War II classroom for training sailors in the identification of naval ships and airplanes.

Fratricide Due to Identification Failures

Finally, many fratricide are due to straightforward misidentification. The first aircraft used in combat in World War I did not even display national insignia. When German ground fire brought down a Zeppelin on August 23, 1913, the Germans painted Iron Crosses on all their aircraft. The British adopted markings too, but quickly learned that gunners confused the Iron Cross and the Union Jack insignia so they switched to red, white, and blue roundels similar to those used by the French at the time.

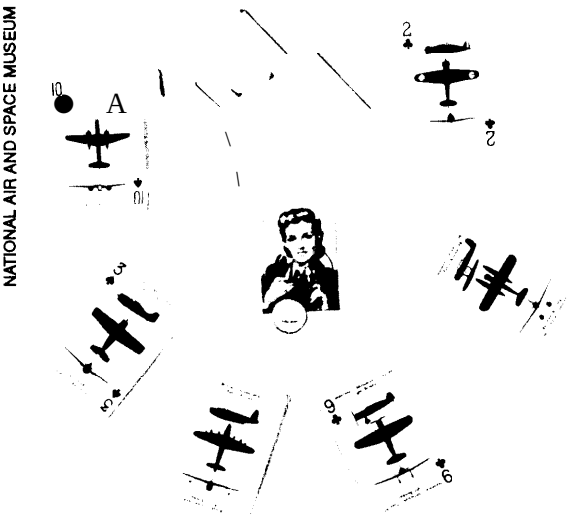
Oftentimes an observer sees what he is looking for, not what he is looking at. The "scientific method' calls for first forming a hypothesis and then searching for evidence that it might be wrong. Psychological tests show that people recognize things in the opposite way, by forming a hypothesis and then searching for additional evidence that it is correct.

On May 15, 1941, a formation of Fairey Swordfish took off from the British carrier *Ark Royal* as part of the epic search for the German battleship, *Bismarck,* They soon spotted a large warship and launched torpedoes against it. But it was the cruiser *HMS Sheffield,* a ship that did not look anything at all like the *Bismarck.* A historian wrote, "Expecting to see the *Bismarck, Bismarck is* what they saw. ' Fortunately, skillful evasion by the *Sheffield* ensured that the torpedoes missed, One Swordfish pilot radioed, ''Sorry for the kipper. ' '[39]

Seeing what one expects to see accounts for a particularly dangerous opportunity for fratricide: patrols returning to friendly lines. Since scouts and patrols are coming from the direction of the enemy, getting past friendly, but nervous, guards and lookouts can be tricky. Thomas ''Stonewall' Jackson went ahead of his own troops to reconnoiter Union lines during the Battle of Chancellorsville. Just as Jackson was returning to confederate lines, forward units of General Joseph Hooker's Union infantry reached the North Carolina troops near Jackson. Some shots were fired and the hastily dug-in Confederates were greatly

38 Wolfgang Dierich, *Kampfgeschwander "Edelweiss": The History of a German Bomber Unit* (London, England: Ian Allen, 1975), p. 26.

39 Ludovic Kennedy, *Pursuit:* The Chase *and Sinking of the Battleship Bismarck (New* York, NY: Pinnancle, 1975), pp. 154-155.



World War 11 troops were given free packs of Airplane Spotter Playing Cards. Maintaining good identification skills requires constant practice,

excited by anticipation of the oncoming assault. Hearing the firing, Jackson hurried back toward his own lines but under the nervous conditions a forward Confederate picket—seeing riders approach from the direction of known enemy forces—shot and mortally wounded the general.[40] Some admirers of Jackson argue that his death changed the course of the war, which, if true, would make it the fratricide of greatest consequence uncovered during this research.

Misidentification due to similarities between weapons are more understandable. Many friendly fire losses during the Battle of Britain were attributed to the similarity of the Supermarine Spitfire Mark I and the Messerschmitt Me-109E fighters. Also, the Bristol Blenheim twin-engine fighter resembled the German Junkers Ju88 medium bomber. The latter similarity lead to the destruction of three Blenheims. One section of Canadian Hurricanes, thinking that the planes below them were Junkers, attacked but pulled away at the last second when the leader realized his mistake. The next section still went in for the attack, in part because they mistook the yellow and red Very recognition flares for tracer fire from machine-guns. One Blenheim blew up in the air and the other two crash-landed.[41]

During World War II, considerable effort and attention went to improving identification of aircraft. As one response, the British developed electronic IFF devices. A touring "air circus" was also organized so ground forces could practice identifying real aircraft overhead, not resin models in a classroom.

TACTICAL CONSTRAINTS DUE TO FEAR OF FRATRICIDE

At times in the past, fratricide has been accepted as a costly necessity of combat. For example, World War I tactics made some fratricide almost inevitable. Trench defenses could be captured if the defending machine guns were suppressed by artillery fire while the attackers approached the trench works; thus, the attackers wanted the artillery to pound defensive positions up to the last second. In this situation, attackers were willing to have friendly artillery fall very close because they believed that the losses due to fratricide would probably be less than those from enemy machine-gunners .42 A World War II battalion commander said, "We must teach our soldiers to remember that when they follow the artillery barrages and air strikes closely, they

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40 G.F.R. Henderson, *Stonewall Jackson and the American Civil War (New* York, NY: *Da* Capo, 1988), P. 678.

41 Richard Collier, *Eagle Day (New* York, NY: Avon, 1969), p. 140.

42 For example, from Ian V. Hogg, *Barrage: the Guns in Action* (New York, NY: Ballentine Books, 1970), p, 21, "The French, with their greater elan and still-unconquered spirit of attack at all costs, were known to observe that unless the infantry suffered 10 percent casualties from their own artillery, they weren't following the barrage close enough!" or". . the 'creeper' [rolling barrage] covered the ground progressively in front of and behind the objectives. All the infantry had to do was to stay close to it even if the occasional short round sprayed them with shrapnel." from Shelford Bidwell and Dominick Graham, *Fire Power: British Army Weapons and Theories of War, 1909-1945* (London, England: Allen and Unwin, 1982), p. 111.

eventually suffer fewer casualties even though an occasional short may fall on them. ' '[43]

Yet no commander can afford to be indifferent to fratricide and avoiding it can limit tactical options. For example, the need to insure safety of infantry operating with artillery severely hampered the flexibility of the massive British battle plans for the great World War I attack at the Somme.

Fratricide has a greater cost than the direct combat loss of the forces hit. Fear of fratricide can so inhibit a commander's actions that combat efficiency is much reduced. The Center for Army Lessons Learned (CALL) reports several consequences of fratricide incidents that reduce combat effectiveness.[44] These are listed in Table 2-1.

Table 2-l—Detrimental Effects of Fratricide

- Hesitation to conduct limited visibility operations
- Loss of confidence in unit's leadership
- Increase of leader self-doubt
- Hesitation to use supporting combat systems
- Oversupervision of units
- Loss of initiative
- Loss of aggressiveness during fire and maneuver
- Disrupted operations
- Needless loss of combat power
- General degradation of cohesion and morale

SOURCE: Center for Army Lessons Learned.

In addition, friendly fire does not need to kill to have a *suppressive* effect. In some instances, for example in World War II battles on the islands of Biak and Luzon, groups of infantry as large as battalions spent whole afternoons pinned down by friendly fire of various sorts, seriously disrupting coordination of attacks.

Nighttime World War 11 naval battles are filled with cases of tactical confusion in general and fratricide in particular. During the Battle of Cape Esperance, control broke down from the start with the charge of the destroyer *Duncan,* described above. The situation became so confused so quickly that the American group commander, Admiral Scott, ordered ''Cease firing, our ships! Scott further ordered that ships flash their recognition light (colored lights up either side of the bridge) .45

The Americans' problems with sorting out the situation benefited the Japanese enormously. Firing was halted for four minutes. This may not seem like much until considering that the heavy cruiser *Salt Lake City* had fired 80 eight inch rounds in the first two minutes of the battle and the light cruisers were averaging an incredible 150 rounds a minute each—so four minutes was a long time. Furthermore, the signal lights revealed the ships' locations to the Japanese.

Finally, the lights *identified the* U.S. ships for the Japanese. Ironically, their commander, Admiral Goto, had thought that he was under mistaken attack from another Japanese force and had been hesitant to return fire, but the distinctive recognition lights showed the force to be American. Within an eight minute period shortly after midnight, Scott ordered recognition lights to be flashed three more times. The group was never completely under control and both sides withdrew without a clear decision.

During the Battle of Savo Island in the early morning hours of August 9, 1942, the crew of the heavy cruiser *Vincennes* believed that she was coming under friendly fire so she hoisted a huge American flag up the mast. The Japanese assumed that this must mean that she was the flagship and therefore concentrated their fire on her. Two minutes later, Japanese cruisers took the U.S. destroyer, *Ralph Talbot,* under fire. Her skipper,

43 Schrader, op. cit., footnote 5, p. 17. Also from footnote 53 of chapter one of Schrader: ''An experienced infantry officer who served as a battalion S-3 in Vietnam related to the author that it was his common practice (and that of others) to accept up to 5 percent friendly casualties from friendly artillery in the assault before lifting or shifting fires. The rationale, of course, is that it is preferable to suffer 5 percent casualties from one's own fire plus 5 percent from the enemy than to permit the enemy, through lack of adequate suppression, to inflict 15 percent casualties on the attacking force. '

44 Center for Army Lessons Learned, *Fratricide Risk Assessment for Company Leadership,* CALL Handbook No. 92-3 (Fort Leavenworth, KS: Center for Army Lessons Learned, March 1992), p. 4.

45 Unless otherwise cited the following naval accounts arc from Kilpatrick, op. cit., footnote 10.

Lt. Commander Callaham, also believed that he was being fired on by friends so he turned on his recognition lights. This action was so unexpected that the Japanese were momentarily flummoxed, worrying that perhaps they were firing on another Japanese ship. The Japanese cruisers were forced to use search lights to illuminate the *Talbot.* She took several hits but escaped into a squall.

Nearby, on August 21, again in the early morning darkness, the U.S. destroyer *Blue* and the Japanese destroyer *Kawakaze* detected one another at almost the same time. The American ship was equipped with radar, which the Japanese had deployed on only a very few ships-and those units were primitive. For night fighting, the Japanese relied instead on specially trained lookouts equipped with oversized, night-use binoculars. During clear weather, the Japanese visual method was as good as U.S. radar. In this particular case it was better. For whereas the *Blue* detected a blob on a radar screen, the *Kawakaze* detected and *identified* target. Thus, as the *Blue* was creeping forward to get a better view, the *Kawakaze* was launching 21-inch diameter *"Long* Lance" torpedoes that ripped the stern off the American destroyer. She was later scuttled.[46]

During the closing moments of the Battle of Empress Augusta Bay, the cruiser *Montpelier* received direct orders to fire at a target at specified coordinates. In the pre-dawn darkness, the *Montpelier's* commander was uncertain of the target and intentionally directed that the first salvo should miss. He then listened in on the TBS (Talk-Between-Ships) radio for two minutes and, failing to hear any complaints, commenced firing to hit. This time, the incoming rounds quickly got the attention of the target, which turned out to be the American destroyer *Spence.* Radio calls for a cease fire were heeded before any damage was done but, clearly, the lack of identification required a tactical solution that would have given some advantage to an enemy, either a chance to evade further fire or return fire.

Caution induced by fear of fratricide can be exploited by an enemy. During World War II, artillery fire began the preparation for an attack by the 3rd Infantry Division against the town of Osheim on January 23, 1945. The leading battalion reported that shells were landing on their position and the barrage was halted. More range was added and the barrage resumed but rounds still fell on the lead battalion. Finally, the Americans discovered that the fire was coming from nearby German tanks that held their fire until the barrage started, specifically to fool the Americans into believing they were receiving friendly fire and so trick them into calling a halt to the barrage. (Incidently, the 3rd Division later adopted rules that called for finishing planned barrages regardless of reports from forward units, which may have contributed to later fratricides.)[47]

The Japanese also used the technique of synchronizing the artillery fire with their enemy artillery, although perhaps for different reasons. On Guam and elsewhere in the Pacific theater, Japanese artillery and mortar crews would wait until U.S. artillery was firing before firing their own guns, thus increasing the difficulty of locating them by their sound. In addition, of course, U.S. troops noticed that when U.S. artillery fired, they often received incoming rounds, causing them to believe it was friendly fire.

THE PREVALENCE OF FRATRICIDE

Any conclusions about the general prevalence of fratricide developed from a collection of anecdotes must be regarded with healthy skepticism. Several sources use a figure of two percent of casualties that have been due to fratricide in

46 Stewart, op. cit., footnote 37, p. 50.

47 Schrader, op. cit., footnote 5, p. 9.

20th century wars. In fact, the two percent figure seems to have become almost a rule of thumb.[48]

One of the great difficulties is knowing who fired which shot. Only rarely is reliable evidence available, but it is sobering to discover that when evidence is there, it often reveals fratricide that participants at the time were unaware of. Two cases from the same campaign provide interesting examples. The reader has doubtless noticed that many examples used here come from the Solomons naval campaign. This is not surprising when one considers that many of the major battles there took place at night, resulting in poor coordination and frequent misidentification. But the same conditions that made mistakes likely made it unlikely that they would be detected.

In one case, however, U.S. friendly fire left a clear fingerprint. U.S. warships carried a limited supply of ''dye-loaded" shells, with each ship carrying a different color. The added dye allowed two ships shooting at the same target to distinguish the splashes of rounds hitting the water and thus independently adjust their fire. When the light cruiser *Atlanta's crew examin*ed battle damage after nighttime engagements off the coast of Guadalcanal, they discovered nineteen hits from eight inch shells loaded with green dye, the color of the heavy U.S. cruiser *San Fransisco.*

The depleted-uranium rounds used by U.S. tanks during the Persian Gulf War left a similar telltale and again, fratricide rates turned out to be higher than previously suspected. That combat is discussed further in the last section of this chapter.

Perhaps the best estimate of overall rates of fratricide come not from traditional military histories and action reports but from the medical records. The U.S. military has long kept records of the causes of casualties. Unfortunately, the normal reports lack enough detail to determine conclusively that a casualty was caused by friendly free. Moreover, without a detailed accounting of *all* casualties in a given time or place, we cannot know the numerator and denominator needed to calculate the *fraction* of casualties caused by friendly fire.

In a few cases, starting in World War II, however, detailed casualty surveys have been carried out that allow a reliable estimate of the frequency of friendly fire losses in those cases. The frost was conducted by Dr. James Hopkins, who maintained detailed records of cause of wound for every casualty in his batallion. He served for part of the war on New Georgia Island-near Guadalcanal--and part in Burma. He examined the wounded and conducted interviews after actions. Hopkins was able to determine that 16 percent of those killed and 19 percent of those wounded were the victims of friendly fire by his broad definition, which includes accidents in the use of weapons.[49] By TRADOC's current, narrower definition, as applied by Dr. David Sa'adah of the Department of the Army, Surgeon General's Office, the figures would be 13 percent and 14 percent.[50]

Two other comprehensive surveys examined all of the casualties from two divisions in Bougainvillea, in the South Pacific, in 1944. Almost a hundred of the killed were more carefully examined by autopsy to determine cause of death.[51] These surveys reveal that 24 percent of

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48 See Schrader, op. cit., footnote 5, p. 105; Trevor Duprey, *Attrition:* Forecasting *Battle Casualties and Equipment Losses in Modern War* (Fairfax, VA: Hero Books, 1990), p. 3; and Dwight Dickson and Elrin Hundley, "Avoiding Not So Friendly Fire," *Military Review,* July 1992, p. 57.

49 James Hopkins, ''Casualty Survey-New Georgia and Burma Campaigns, '' in James C. Beyer, cd., *Wound Ballistics* (Washington DC: Office of the Surgeon General, Department of the Army, 1962), pp. 237-280 from the series, *Medical Department, United States Army in World War II*, Colonel John Lada, Editor in Chief.

50 See Colonel David M. Sa'adah, Office of the Surgeon General, Headquarters, Department of the Army, "Friendly Fire: Will We Get It Right This Time?' p. 7.

51 Ashley W. Oughterson et. al., ''Study of Wound Ballistics—Bougainville Campaign, " in Beyer, ed. op. cit., footnote 49, pp. 281-436.

the deaths were due to fratricide, using the narrower current TRADOC definition.[52]

In Vietnam, only the United States and its allies had certain types of weapons, for example, air-delivered ordnance of any sort-especially napalm, certain types of artillery, and so on. Thus, by examining the wounds of casualties and determining g the type of weapon that caused them, one can estimate the fraction that are caused by friendly weapons. Using this approach, some unpublished reports cited in the press estimate that perhaps 15 to 20 percent of the casualties in Vietnam were fratricides.[53]

The U.S. Army also conducted careful casualty surveys during the Vietnam War that were compiled in the Wound Data and Munitions Effectiveness, or "WDMET" study. The data were collected between 1967 and 1969 from elements of one cavalry and three infantry divisions. An absolute figure for fratricide is not available from the WDMET survey. However, the data include the type of weapon causing the injury, and in four cases the type is very specific and was almost certainly in the hands of U.S.-or at least allied-troops: the M16 rifle, the M79 grenade launcher, artillery (excluding mortars), and Claymore mines. These four weapon types alone accounted for 11 percent of all U.S. casualties, including 10 percent of the fatalities.[54] The summary of the data compiled by Colonel Sa'adah is shown in table 2-2.

These casualty surveys cover only limited cases for which data are available, but again it is worthwhile to note that in every case where data are available, the fratricide rate is significantly higher than the two percent that frequently **appears** in print as the nominal fratricide rate.[55]

Despite the hit-and-miss of using historical anecdotes, the types of fratricide do show some patterns. As might be guessed, indirect fire weapons or long-range weapons (in past wars, artillery and bombers) have been more likely to be responsible for friendly fire. Also, the damage done by these weapons is disproportionately great because mistakes involving single-shot weapons, like tank guns, kill one friend at a time, while artillery barrages and bomber attacks can devastate whole units. The Persian Gulf war did not have any artillery fratricide. This may be good luck or reflect an important change brought about by better communication and navigation.

Perhaps surprisingly, there seems to be no strong correlation between type of action and likelihood of fratricide; it is just as likely during offense or defense. Fratricide between neighboring units appear to become more likely the greater their separation in the chains of command. Whenever units operate near one another and have poor communication, poor navigation, or are poorly controlled, fratricides can occur.

Fratricide of almost any type are more likely during periods of limited visibility when identification is harder. However, although better identification is frequently presented as *the* solution to friendly free, Schrader classified only about a quarter of the cases in his review as due *primarily* to misidentification. The majority of fratricide were more properly explained by failures of command and control or fire discipline. See figure 2-1.

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52 Sa'adah, Op. cit., footnote *50,* p. 8.

53 David Morrison, "Foes Not the Only Threat in the Gulf War," *National Journal,* Feb. 9, 1991, p. 335, citing the work of Colonel David HackWorth.

54 Sa'adah, op. cit., footnote 50, p. 10.

55 During the course of this assessment, the author has had several opportunities to collect personal accounts from military personnel that served in Vietnam. This is admittedly a totally unscientific sampling but the clear concensus is that a 2 percent fratricide rate is a serious underestimate. See also app. A in Colonel Sa'adah's paper, "The 2 Percent Nonsense."

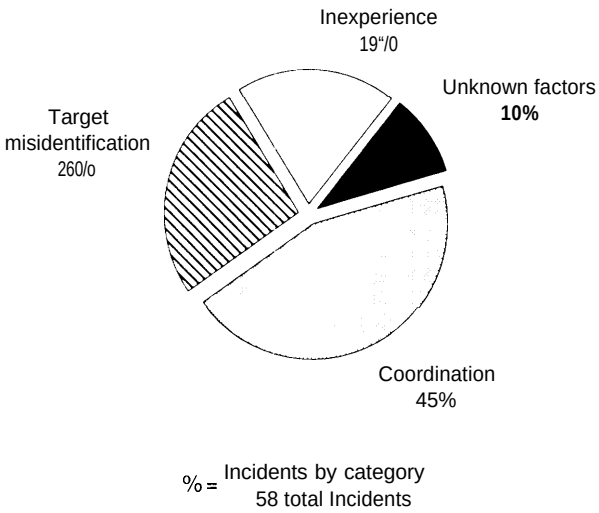
Table 2-2—Friendly Fire Data in Combat Casualty Surveys—World War II Through Operation Desert Storm

Survey location/name forces in survey	Line	No. of cases in survey	No. of cases KIA + DOW	No. of cases WIA	KIA + DOW by friendly fire No.	KIA + DOW by friendly fire %	WIA by friendly fire No.	WIA by friendly fire %	Prevalence: survey definition	Prevalence: TRADOC definition
New Georgia and Burma/Hopkins	Ia	370	102	268	16	16	50	19	17.970	
Jungle perimeter defense	Ib	353	99	254	13	13	36	14		*14%*
July 18-Aug. 5, 1943, Spearhead across Burma, Feb. 15-June 8, 1944										
Bougainvillea Beachhead perimeter	2a	1,788	395	1,393	63	16	156	11	*12.3%*	
defense	2b	1,778	392	1,386	60	15	149	11		12%
Feb. 15-Apr. 21, 1944										
Bougainvillea autopsy	3a	99	99	0	30	30	0	0	Not computed	
Mar. 22-Apr. 21, 1944, 25% of all KIA + DOW within Bougainvillea survey	3b	91	91	0	22	24	0	o		*24%*
Vietnam WDMET	4a	5,993	1,279	4,714	NC	NC	NC	NC	"almost	
Components of 5 Army divisions	4b	5,993	NC	KIA+DOW=WIA=667					certainly more	*11%*
June '67-June '69, preferably in offensive engagements									than 10%"	
Vietnam WDMET autopsy	5a	500	500	0	NC	NC	o	o	Not reported	
July '67-Nov. '68, 500 consecutive autopsies within VN WDMET	5b	500	500	0	51	10	0	o		10940
All U.S. Forces, Jan. 17-Dee. 15, 1991	6a	613	146	467	35	24	72	15		17%
Operation Desert Storm	6b	613	146	467	35	NC	72	NC	Not reported	

Within each survey, Line a displays the data as presented in the original study. Line b standardizes this same data to the current TRADOC definition of "fratricide."

KEY: DOW = died of wounds; KIA = killed in action; WIA = wounded in action; NC= not calculated.

Figure 2-1 —Causes of Fratricide: Direct Fire Fratricide in World War II, Korea, and Vietnam



SOURCE: U.S. Army

THE NATIONAL TRAINING CENTER

Data collected from the National Training Center (NTC) at Fort Irwin, California are important enough to warrant special notice. The Army maintains training centers where visiting units can engage in mock combat with "OPFORS' or "opposing forces. " The NTC is of particular interest because it has been equipped with a sophisticated laser direct-fire engagement system called the Multiple Integrated Laser Engagement System, or MILES. The NTC is also equipped with location and engagement recording systems.

Guns on tanks, infantry fighting vehicles, even personal rifles, are equipped with lasers. When the gun 'fires' a blank round, the laser also fries. Each of the major weapons and each of the personnel have detectors that sense when a laser "hit" occurs.

The laser pulses are coded in such a way that the detectors know the type of weapon that freed. Thus, if a tank detects that it has been shot by a rifle, nothing happens; but if a rifleman's sensor detects that he has been shot by a tank, his sensor registers a' 'kill.' A kill is signified by activating a flashing light. Each shot and each hit activates a small radio pulse indicating type of shooter and target, which is picked up by antennas spaced around the training center. These data are recorded along with their time, and data are analyzed by computer after each exercise to explain to the participants various mistakes that were made.

The Army emphasizes that its training centers are for *training,* not experimenting or data collecting, so the system has not been set up with fratricide data collection in mind. It nevertheless provides invaluable insight into the causes of fratricide. Some questions arise about the relevance of the data since these are not real battles so perhaps the participants do not behave the way they would in actual combat. Nevertheless, the data are enormously rich compared to information about real battles, so if one believes the simulation valid, the data are proportionately useful. One can then try to examine hits caused by friendly fire and hope to learn something of the circumstances.

Much of the following is taken from a brief RAND study that evaluated data from 83 battalion-sized battles.[56] See figure 2-2. Considering the causes of the fratricides observed, the study states:

> Of the 18 cases of fratricide, one-half could have been prevented had the shooting vehicle been aware of the location of a sister organizational unit, for the destroyed vehicle was located in a friendly formation with no enemy nearby. Another third of the cases could have been prevented if the shooter had knowledge of the location of individual isolated friendly vehicles, a more difficult requirement. One-sixth of the cases involved the killing of a friendly vehicle while close to opposing force (OPFOR) elements.

56 Martin Goldsmith, *Applying* the National Training *Center Experience-Incidence of Ground-to-Ground Fratricide,* RAND Note N-2438-A (Santa Monica, CA: The Arroyo Center, RAND Corporation February 1986).

In this class, only an Identification Friend or Foe (IFF) device could provide the information necessary to positively avoid fratricide.[57]

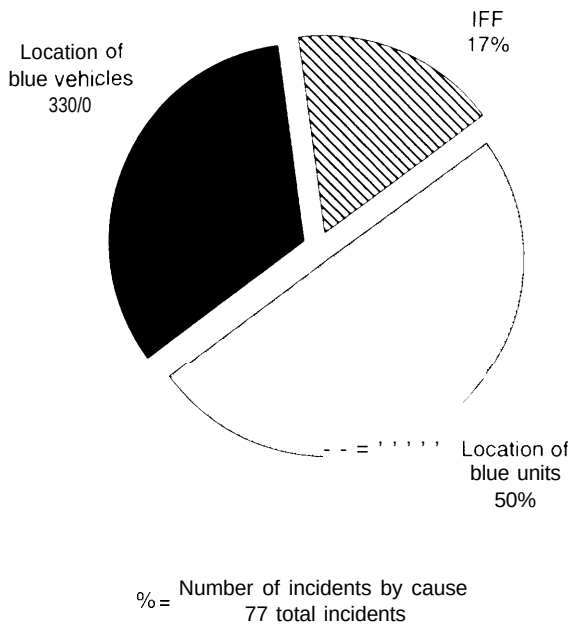
The data indicate that at least 1 percent of the "blue" vehicles killed were killed by friendly *direct* fire. This figure is much less than in the Persian Gulf War. Two possible biases may explain the difference. The NTC data may underestimate some fratricide. For example, if the lasers cannot penetrate through dust, then no kill is recorded even though a tank round would have scored a hit in actual battle. This effect works to reduce hits from enemy attacks as well as fratricidal attacks, but since fratricide is more likely to occur in dustier conditions, it might be under-recorded to some degree. In addition, the OPFOR train all year long on the same ground and are excellent troops (according to their own evaluation, not just good but the best). Thus, total blue "casualties" are usually high in the simulated combat, unlike the Persian Gulf experience, and the resultant ratio of friendly fire casualties to total blue casualties unusually low.

Artillery cannot be simulated with MILES but other means are available, The data available indicate that 3.6 percent of artillery fire missions resulted in some fratricide. This result appears worse when one considers that only about a third of the artillery missions hit anything at all, friend or enemy. Thus, *of those artillery fires that hit anything,* about one-tenth hit friendly forces. Experience at the NTC also suggests that fratricide resulting from artillery-delivered mines and unexploded submunitions may be almost as serious a concern as other artillery fratricides, although the MILES data do not now allow a quantification of this effect.

Some fratricides were clearly caused by misidentification but more were due to disorientation. (This result depends on the terrain; preliminary unpublished data from a similar test facility in Hohenfels, Germany suggests that disorientation is not as important there as misidentification. However, the German test range is much smaller and some nearby hills apparently provide easy orientation landmarks.) Several fratricides at the NTC occurred when no enemy forces were nearby and, moreover, the commanders knew that enemy were unlikely to be near.[58] These cases could be cured by better fire discipline. Mistakes due to true misidentification were most common in melees and poor visibility.

The data collected at the NTC is now being exploited for fratricide ''lessons-learned.' Most of this work is now coordinated through CALL, or the Center for Army Lessons Learned, part of the U.S. Army Combined Arms Command at Fort

Figure 2-2—Types of Information Needed to Avoid Fratricide: Direct Fire Fratricide at the National Training Center



SOURCE: U.S. Army.

57 Ibid., p. vi.

58 Ibid., p.13.

Leavenworth, Kansas.[59] Since the Persian Gulf War, observers at the NTC have had to fill out fratricide incident reports whenever MILES detects friendly free. Preliminary unpublished results show that observers on the ground attribute fratricide most often to identification failure, but that this accounts for just over a fifth of the cases, with another fifth due to failures of command and control, another fifth due to planning failure, and a combination of communication and navigation problems and simple mistakes making up the balance. Incorrect assessment of the tactical environment was cited as the most common contributing cause.

MILES is being expanded at other training centers and will no doubt provide increasingly valuable information about how fratricides occur and can be avoided.

FRATRICIDE DURING THE PERSIAN GULF WAR

The current surge in interest in fratricide is due largely to the experience of the recent Persian Gulf War. Wars are complex and no two are identical, so "lessons" from the war should not be considered universal truths. Although many conditions in the Persian Gulf were special, some argue that this war was a first example of the "high tech" wars of the future. It may also be representative of a type of war that will be more common for the United States in the future: one in which massive, overwhelming force is applied quickly and decisively. A primary appeal of these types of actions is that U.S. casualties are potentially very low considering the scale of the military operation. This report has pointed out already that one reason the fraction of casualties due to fratricide was high is that total U.S. casualties were so very low. Another way of looking at this is that if low casualties are characteristic of an important class of future conflict, then the *relative* importance of fratricide will be much greater.

There were 615 U.S. battle casualties in Operation Desert Storm, 148 of which were fatal. Of the 148 fatalities, 35-or 24 percent—were caused by friendly fire. Of the 467 nonfatal battle casualties, 72--or 15 percent—were caused by friendly free. These percentages seemed high at the time when compared to those assumed from wars past but the review of past rates of fratricide suggest that there has been a substantial underappreciation of the rate of fratricide in past wars.

Of the 35 soldiers killed by friendly fire, seven were on the ground while the 28 remaining were in vehicles. This distribution reflects the highly mobile, mechanized nature of the combat—that is, most U.S. forces were in vehicles so one would expect more casualties there-but it is also hopeful for those seeking a technical solution, since mounting combat identification equipment on vehicles is much easier than mounting it on individual infantrymen.

A case-by-case description of the known fratricide incidents is listed in table 2-3.[60] Few individual cases stand out as being unique to the modern equipment used in the Persian Gulf War. In one instance, a radar-seeking missile lost track of the Iraqi radar for which it was intended and-while attempting to reestablish a target track-locked onto a nearby U.S. radar. This type of technology-dependent mistake is, however, the exception; many of the descriptions of friendly fire—with a change of weapon designation—could have taken place in the deserts of North

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59 At the time of this writing, CALL's research is still in draft form and unpublished but their results seem so far to confirm the RAND work. Major Rick Bogden, personal communication, February 1993.

60 This information is taken from "W@ Probes Friendly Fire Incidents, " a news release from the Office of the Assistant Secretary of Defense (Public Affairs), dated Aug. 13, 1991. Note that some of the incidents are not ''fratricide' by the narrowest definition now used by the Training and Doctrine Command. For example, casualties due to faulty missiles or artillery rounds would be considered accidents because they did not result from a deliberate act of firing, believing one was firing at the enemy.

Table 2-3—Persian Gulf Friendly Fire Incidents—1 991

Ground-to-Ground

January 29-Four Marines were killed when their Light Armored Vehicle (LAV) was struck by a TOW missile which was fired from another LAV west of Kafji, Saudia Arabia.

February 14-Three soldiers were wounded in a small arms exchange during urban clearing operations in the town of Arky Amah Al Jadid, Saudi Arabia.

February 24-One Marine was killed when the convoy he was in received fire from a tank.

February 26-Three soldiers were killed and three wounded when their armored personnel carrier (APC) was hit by machine gun fire from a tank.

February 26-One soldier was killed when his vehicle was hit by a premature burst of an artillery round.

February 26--Five soldiers were wounded when their Bradley Fighting Vehicle (BFV) was incorrectly identified and hit by a TOW missile.

February 26--Two Ml Al Abrams tanks were hit by fire from another M 1 Al tank. No casualties occurred.

February 26-Two soldiers were killed and six wounded **when their BFV, which was operating in reduced visibility, received fire from a M1A1 Abrams tank.**

February 2&Two BFVs, while operating at night in reduced visibility, were fired upon by a Ml Al tank. No casualties occurred.

February 27—Six soldiers were killed and 25 wounded when five M1A1 tanks and five BFV's engaging enemy forces were incorrectly identified at night in reduced visibility and engaged by other M1A1 tanks.

February 27—Two soldiers were killed and nine were wounded when three BFVs were fired upon by a M1A1 tank because of incorrect identification.

February 27—Three damaged M1A1 tanks were deliberately destroyed by other Ml Al tanks to assure they could not be used by the enemy.

February 27-One soldier was killed and one wounded when 2 BFV's were incorrectly identified at night in the rain and fired upon by a Ml Al tank.

February 27-One soldier was killed and two were wounded when two BFV's were hit by fire from a M1A1 tank while operating in rain and smoke at night during an attack on a bunker complex.

February 27—Two soldiers were killed and two wounded when their BFV was fired upon by a Ml Al tank while operating at night in reduced visibility.

February 27----One soldier was killed and one wounded by machine gun fire when they were incorrectly identified as Iraqi forces.

Air-to-Ground

January 23-A USAF A-10 Thunderbolt fired on a Marine observation post with no casualties.

January 24--One Marine and one sailor were wounded when a USAF A-1 O strafed a USMC Hummvee and a five-ton truck about 60 miles west of Kafji, Saudia Arabia.

January 29-Seven Marines were killed and two wounded when a USAF A-1 O fired a Maverick missile which malfunctioned in flight and hit a LAV,

February 2-One Marine was killed and two were wounded during an air attack by a USMC A-6E using 500-pound bombs after their vehicles were incorrectly identified as Iraqi.

February 2—Two soldiers were wounded when a HARM missile fired by a USAF F-4G Wild Weasel did not properly acquire its intended target and locked onto the soldiers' radar.

February 4-A HARM missile is suspected to have landed close to the USS Nicholas (FFG-47) resulting in no casualties and only superficial damage to the ship.

February 17—Two soldiers were killed when a BFV was struck by a Hellfire missile fired from an AH-64 Apache helicopter. Six soldiers were wounded and aground surveillance vehicle was also damaged in the incident.

February 23-One Marine was killed and one wounded when a HARM missile from an undetermined source struck a radar unit.

February 24-A HARM missile is suspected to have landed close to the USS *Jarrett* **(FFG-33) with no casualties or damage to the ship.**

Ship-to-Ship

February 25--USS *Jarrett (FFG-33)* **fired at a chaff rocket launched by USS** *Missouri* **(BB-63) resulting in superficial damage to USS** *Missouri. No* **casualties occurred.**

March 27—USS *Avenger* **(MCM-1) received small arms fire while in the vicinity of Ras Al Qalayah. No casualties occurred and the ship moved out of firing range.**

Ground-to-Air

February 15-A USN A-6E pilot reported he was fired upon by a surface-to-air missile, resulting in no casualties.

SOURCE: Assistant Secretary of Defense (Public Affairs).

Africa in 1942 rather than the deserts of Iraq a half century later.

In one barely avoided fratricide, a group of tanks was waiting for a second unit to catch up. Radio communication confirmed that all of the second unit's forces were behind the frost unit. Two Iraqi T-55 tanks crossed in front of the first unit, which quickly destroyed the enemy tanks. Just minutes later, two more armored vehicles were detected, moving in the same direction as the original T-55s. From consideration of the tactical situation, they obviously seemed part of the same Iraqi group. An alert tank gunner noticed, however, that the vehicles showed on the thermal imager the characteristic 'hot wheels' of U.S. infantry fighting vehicles and called out to hold fire. In fact, these were the scouts from the other units reported behind-but showing up ahead of—the first unit and reported heading north but actually going west, which unfortunately was the same direction as the nearby enemy force.[61]

Another case did not turn out so well. Two units were traveling at night in parallel but not in constant visual contact because of a gentle rise between them. The units passed on either side of an Iraqi infantry force armed with rocket-propelled grenades. The Iraqis fired at U.S. infantry fighting vehicles to one side. The explosions were seen by U.S. tanks in the other unit, which mistook the explosions for gun flashes from Iraqi tanks. The U.S. tanks returned fire and hit some of the U.S. infantry fighting vehicles.[62]

There were no fratricides of airplanes. Air superiority was so complete and accomplished so quickly that very restrictive rules of engagement were possible, which might have hampered the effectiveness of the air arm but avoided any fratricide.

SUMMARY

A historian might wince at drawing lessons from a collection of anecdotes, but some general points come through. First, fratricide result most often from a complex chain of errors. The stories often read: identification was wrong, yes, but misidentification would have been unimportant if navigation had been reliable, navigation errors could have been overcome if communication had been adequate, and so on. Also, these anecdotes make clear that while misidentification often leads to fratricide, failures of command, communication, coordination, and fire discipline are at least as important. Although an accurate estimate of the overall frequency of fratricide is impossible to determine, the two percent rule of thumb presented by Schrader and others is almost certainly too low. In every case in which good data are available, the actual rate of fratricide turns out to be much higher than two percent and higher than most would guess. Finally, the types of fratricide change much less quickly than military technology. This suggests that technology is only part of the solution; reducing fratricide will always depend on the training and skills of the combatant in the field.

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61 Center for Army Lessons Learned, "Fratricide: Reducing Self-Inflicted Losses," *Newsletter* (April 1992) No. 92-4, p. 1.

62 This case is remarkably similar to one occurring at the National Training Center, described by Goldsmith. In that case the flashes were simulated incoming artillery, but friendly units on either side took them to be gun flashes from enemy forces and returned fire.