

# **Catastrophic Interdiction: Air Power and the Collapse of the Iraqi Field Army in the 2003 War**

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This report analyzes an important aspect of Operation Iraqi Freedom (OIF): the interdiction of Iraqi ground units by coalition air forces. Based on air campaign statistics, observations from the field, and the experience of past air campaigns, the report assesses the likely impact (in terms of combatant casualties) of coalition air attacks on the Iraqi army in the field. Our approach is a comparative one that views the OIF air interdiction campaign in light of the experience of the 1991 Gulf War. Among the issues we explore is the contribution of coalition air power to the catastrophic collapse of the Iraqi Republican Guard and regular army.

Excluded from our analysis are close air support missions, offensive counter-air missions, military infrastructure attacks, and attacks on strategic targets (including political targets). Also excluded are attacks by coalition ground forces, including associated rotary-wing aviation. These are examined in a subsequent report to be released 1 October 2003.

For the purposes of the present report, air interdiction of ground forces is distinguished from the close air support mission by its focus on targets that are some distance from one's own troops. Functionally speaking, close air support missions help decide the immediate battle, while air interdiction missions shape the battlefield and help determine tomorrow's battle

## **1. Interdiction of Ground Units as a Component of the OIF Air Campaign**

In Operation Iraqi Freedom, coalition fighters and bombers flew about 20,700 sorties and struck approximately 19,900 aim points, delivering 29,900 munitions of which 19,948 or 68 percent were of guided types (Precision Guided Munitions or PGMs) and 9,251 were unguided. {1} A reasonable assumption based on campaign statistics is that interdiction of Iraqi ground units in the field involved more than 12,000 of the aim points (or 60-plus percent) and more than 20,000 of the expended bombs and missiles (or 67-plus percent of the total). {2} In this estimate, approximately 58 percent of the weapons used against the Iraqi army in the field would have been of guided types.

Most of the effort against Iraqi ground troops was focused on Republican Guard divisions and on a handful of stalwart regular divisions that formed part of the defensive ring south of Baghdad. {3} None of these divisions were at full strength, except perhaps the Medina (which was reinforced by elements of other divisions). All told, the Republican Guard plus several stalwart regular divisions probably comprised 85,000 troops. Another 35,000 Iraqi troops in five or six regular divisions played some role in the fight (or, at least, came under attack before withdrawing or disintegrating). {4}

## **2. A Look Back at the 1991 Air Campaign**

By contrast, in the 1991 Operation Desert Storm (ODS), coalition fighters and bombers flew almost 60,000 sorties and conducted more than 41,000 strikes of which more than two-thirds were directed against ground force targets, including not just troops but also their installations and depots. {5} Approximately 227,000 bombs and missiles were expended by US fixed-wing aircraft during ODS and 14,825 of these were of guided types. {6}

The total percentage of weapons employed against ground force and related targets was approximately 73 percent. All told, about 165,000 munitions were delivered against ground force and related targets in Desert Storm; approximately 6,000 of these were precision weapons and 159,000 were unguided. {7}

The total number of Iraqi army personnel deployed in the theater of operations was probably about 360,000 at the start of the air war -- an estimate that takes into account the fact that Iraqi divisions were substantially under strength. The number further declined to approximately 210,000 in the course of the air war as Iraqis deserted their units. During the 1991 Gulf War, the personnel attrition for Iraqi ground units that was attributable to the air war phase of the conflict averaged 2.5 percent of the total deployed at the beginning of the air campaign, according to interviews with senior Iraqi officer POWs. {8}

### 3. Comparison of OIF and ODS Air Campaigns

One third as many fighter and bomber sorties were flown in OIF as in ODS and only 13 percent as many air-delivered munitions were used. However, the proportion of guided weapons was much higher -- 67 percent versus 6.5 percent; indeed, their absolute number was 35 percent greater. Commensurate with the increased number and proportion of guided munitions employed in OIF, there were more targets engaged per sortie than in ODS. And, presumably, these engagements were much more effective -- also as a function of the increased reliance on guided munitions. Thus, the reduced effort implied by flying only one-third as many fighter and bomber sorties does not imply a commensurate reduction in impact.

Turning specifically to a comparison of the two efforts against Iraqi ground forces, several differences stand out:

- Approximately 64 percent fewer air-delivered munitions were employed per enemy soldier in OIF than in ODS. This corresponds to 165,000 munitions for 360,000 soldiers (0.46 per soldier) in Desert Storm and 20,000 for 120,000 (0.167 per soldier) in Operation Iraqi Freedom.
- Many more of the weapons used against ground troops in Operation Iraqi Freedom were guided weapons: about 58 percent versus less than 4 percent in Desert Storm. In absolute terms: almost twice as many precision or guided weapons were used against ground forces in OIF than in ODS.
- Although fewer munitions per active enemy soldier were used in OIF, they were delivered in a much shorter time period than in Operation Desert Storm: less than three weeks in OIF versus six weeks in ODS. Still, the average intensity of attack on ground forces -- measured as bombs dropped per soldier per day -- was somewhat less in the recent war than in 1991: about 8.3 bombs per 1,000 soldiers every day in OIF versus 10.7 bombs per 1,000 soldiers every day in ODS.<sup>{9}</sup> However, as noted above, a much greater proportion of the munitions delivered during OIF were of guided types.
- Many more aerial cluster bombs were used in Operation Desert Storm than in OIF -- both in absolute terms and in proportion to the total number of weapons expended and the size of the force attacked. The 1991 Gulf War saw US air forces employ approximately 57,000 aerial cluster bombs -- about 25 percent of all the aerial bombs and missiles used in the war. By contrast, in Operation Iraqi Freedom approximately 1,500 aerial cluster bombs were used by both US and British air forces -- about 5 percent of all the aerial bombs and missiles employed by the Anglo-American coalition.<sup>{10}</sup> In Desert Storm, one cluster bomb was dropped for every six Iraqi soldiers in the field; in OIF, one was dropped for every 80 Iraqis who fought (or one for every 120 or so who spent some time in the field). Notably, in ODS none of the aerial cluster bombs were guided, while in OIF approximately 80 percent were guided.

#### **4. Guided Munitions, Cluster Bombs, and Unit Attrition**

The use of fewer bombs per soldier -- especially fewer cluster munitions -- would seem to entail a lower casualty rate. Increasing the proportion of guided munitions also has been linked, at least in public consciousness, with lower casualty rates. Of course, *what the reliance on guided munitions actually conveys is an ability to strike one's chosen target and achieve one's intended affect using fewer bombs*. Whether or not this produces fewer casualties depends on one's target and intent. For instance, if the aim is to destroy convoys, interdict unit redeployments, or blunt the capacity for infantry attack, then the use of guided weapons would produce a higher casualty rate *per bomb* than would reliance on unguided weapons.

With regard to cluster munitions, which are area weapons that spread bomblets over an area of 10 to 18 acres: more accurate delivery would probably mean a higher casualty rate among the personnel of the targeted unit. Moreover, if an army is relatively well dispersed in smaller units (company size or smaller), increased reliance on guided delivery of cluster bombs probably means a higher casualty percentage overall.

By some estimates, the use of advanced guided weapons allows the user to reduce munitions expenditures by a factor of between 15 and 60. Relevant to OIF, we accept 25:1 as a conservative mid-point estimate for the reduction in bomb expenditure allowed by using a mix of PGMs instead of unguided munitions. {11} Thus, it should not be surprising if US air power was able to achieve levels of Iraqi unit destruction in OIF surpassing those achieved in Desert Storm, despite the use of much less ordnance. At the same time, the level of personnel attrition might be lower if more of the air effort is focused on destroying individual pieces of *equipment*, rather than units or troop concentrations. But this also depends on Iraqi personnel learning quickly enough to gauge and put "safe distance" between themselves and their equipment. Relevant to this is the relative lack of a "ramp-up" period in the OIF air campaign -- that is, a period during which the intensity of air attacks increased gradually.

#### **5. The Intensity of Air Attack: 1991 versus 2003**

In one sense the intensity of the bombing campaign was lower in OIF than in ODS: fewer bombs were dropped per soldier per day. Of course, a truer measure of intensity would look at effects on the ground -- specifically, lethality -- and this would require taking the proportion of precision and guided weapons into account. Moreover, the variance in bombs dropped per day was greater in ODS than in OIF. Desert Storm was distinguished by a long initial period during which air attack on ground forces gradually intensified.

During the first two weeks of Operation Desert Storm, the intensity of attacks on ground units was significantly below the average for the war. Indeed, the attacks did not reach peak intensities

until the fourth week of the campaign. This was sufficient time for those Iraqi troops under attack to learn to steer clear of their vehicles and weapon systems, and it was sufficient time for the lesson to generalize throughout the Iraqi field army. Also relevant was the fact that Iraqi units were already well dug-in and dispersed when the 1991 air campaign began, having begun their field deployment as much as five months earlier. These factors helped keep the unit personnel attrition rate low, despite six weeks of bombardment.

By contrast, in 2003, there were no clear signs of Iraqi military field deployments or preparations prior to mid February -- just a few weeks before fighting began. {12} Once the war commenced, US attacks on Iraqi ground units rapidly intensified, reaching and surpassing their average level in less than a week. This gave units little time to adapt. Thus, a greater percentage of units might have had to learn “the hard way” to put sufficient distance between themselves and their equipment. An analysis in *Air Force Magazine* concludes that this rapid application of air power was key to the sudden collapse of Republican Guard divisions: {13}

Because the Republican Guard divisions did not capitulate, coalition air power hammered them from the beginning of the air war, first with precision strikes against a small number of key targets and later with crushing blows from B-52 heavy bombers dropping both unguided iron bombs and precision weapons. That was a shift from Desert Storm, when those units came in for heavy bombing only after other target sets had been worked over. By early April -- after barely two weeks of combat -- [Combined air component commander Lt. General Michael Moseley] was able to report, “The preponderance of the Republican Guard divisions that were outside of Baghdad are now dead.”

## **6. Iraqi Rate of Desertion**

On the other hand, desertion rates -- which were higher in the 2003 war than in 1991 -- are a factor that might have helped keep Iraqi personnel attrition to percentages below those registered in 1991.

In the 1991 Gulf War, the greatest personnel loss to units was due to desertion: 42 percent of personnel simply left their posts. A variety of factors contributed to this: For six weeks, Iraqis saw their equipment methodically destroyed and watched their comrades die without having any way to respond effectively to coalition fire power. They also had no sense of when this attrition would end. They were increasingly isolated from higher command authorities and cut off from resupply.

During the recent war, Iraqi desertion levels reached as high as 90 percent in some units by early April. Mass desertion by enlisted personnel was often precipitated by or even led by the desertion of officers. Nonetheless, for many units, collapse seemed to be preceded by a period of their holding fast in defensive positions, attempting some substantial counter-offensive actions, and undergoing withering coalition aerial and artillery assaults.

According to press interviews with Iraqi officers and conscripts, the factors contributing to desertion in the recent war -- other than bombardment -- included severe disenchantment with the military's circumstances since the 1991 Gulf War, poor and erratic leadership from national political authorities, growing doubts about the survivability of the Hussein regime, and US electronic and psychological warfare efforts. {14} Countervailing factors were the presence in military units of political "enforcers" -- Baath Party activists, security agency personnel, and fedayeen -- as well as some genuine patriotic sentiments. The tipping point for the field army came at the end of the war's second week. For many units, the immediate catalyst was ten-days of intense bombardment by coalition air and artillery assets.

Thus, while the 1991 ODS air campaign and the Iraqi ground force response to it was characterized by gradually intensifying air attacks, attempts at adaptation by Iraqi ground troops, and a slowly mounting wave of desertions, the 2003 war was characterized by an early and rapid application of air power and little effective adaptation by ground troops, leading to the catastrophic collapse of the ground force after two weeks.

## **7. Unit Personnel Attrition: Evidence from the Field**

How did Iraqi field units fare under air attack in terms of casualties? The available direct evidence -- mostly from journalists' interviews and surveys of battlefields, hospitals, and cemeteries -- is contradictory at first glance, pointing variously to attrition rates both high and low.

One survey of seven battlefields, local hospitals and cemeteries, eyewitness testimony, and interviews with surviving Republican Guard personnel suggests a low number of casualties for a fair cross section of the force -- consistent with a fatality rate of less than one percent. {15}

Other sources suggest much higher rates: {16}

- One distraught Iraqi major -- battalion commander from a division deployed on the eastern side of Baghdad -- reported that one-third of his unit was killed by air attacks between 31 March and 3 April. All told, 1,400 out of 4,000 men in his parent brigade were supposedly killed, although the commander's assertion may be a face-saving exaggeration,
- Another account, from a conscript serving with a 2,000 person unit of the Republican Guard defending Kut, reported more than 150 deaths in a few days of bombardment -- 7.5 percent attrition.
- A third account by a captain commanding a missile artillery unit reported the loss of six percent of unit personnel in a single attack.

- A commander of an air defense unit to the east of Baghdad reported 10 percent fatalities: 25 dead out of a unit of 250.
- A private with a gun artillery battalion on the outskirts of Baghdad reported 5 percent fatalities.

In several of these cases, most of the fatalities were suffered in a single devastating attack.

The differing accounts and observations regarding personnel attrition can be reconciled by understanding that the experience of ground units under attack would vary greatly.

- Air defense and artillery units would have been subjected to especially heavy attack by cluster bombs;
- Several Iraqi divisions were singled out for intense bombardment -- notably the Medina and Baghdad Republican Guard divisions -- both because of their pivotal position, blocking the approach to Baghdad, and as a demonstration to other Iraqi units; {17} and
- Whenever Iraqi units attempted to move -- especially in convoy -- they made themselves exceedingly vulnerable to efficient air attack and, thus, ran the risk of high casualties.

The vulnerability of Iraqi units on the move recalls the experience of the 1991 Gulf War. During that war, six weeks of air attack on dispersed and dug-in units extracted a relatively modest death toll. However, when units mounted their vehicles, concentrated their numbers, and attempted to move -- either on the offensive or in retreat -- coalition air attacks took a devastating toll. This was demonstrated in the four day battle of Kafji that commenced 29 January 1991 and in the two "highway of death" attacks that occurred 25-27 February 1991 along the Al Jahra-Safran and the Al Jahra-Umm Qasr roads, north of Kuwait City. {18}

In the 2003 Iraq war, the Iraqi redeployment of units -- specifically, elements of the Hammurabi, Nebuchadnezzar, and Al Nida -- after 25 March to the south of Baghdad toward Karbala, Hillah, and Al Kut carried a high price in lives. {19} Road movements were steadily bombed by A-10s, British Tornados, and B-52s (dropping 500-pound bombs). In light of this, one US military official confidently predicted that "reports of large formations end up in large numbers of dead enemies." {20} This was confirmed by an Iraqi commander who concluded that the movement south had been one of the regime's major errors: "While they were moving, the Republican Guard were a target for American fighter planes and they lost a lot of men." {21} (By contrast, the movement of units from northern Iraq to the vicinity of Baghdad was reported to have incurred relatively few casualties)

## 8. Calculating Iraqi Combatant Fatalities Due to Air Interdiction

A hypothesis consistent with all the reports is that a small portion of Iraqi units (perhaps 5 percent) suffered attrition rates of more than 10 percent. A larger segment of the force (perhaps 15 percent) might have suffered rates ranging between 1 percent and 10 percent. This 20 percent of severely attacked units would have comprised major elements of the Medina and Baghdad divisions, some of those units who attempted to redeploy south of Baghdad, and air defense and artillery units across the force. The remainder of the force -- fully 80 percent of the units or more -- could have suffered rates of less than one percent, which would be consistent with the *Time* survey. This could produce an overall personnel loss of between 1.4 and 1.8 percent which, for a force of 120,000, would imply between 1,700 and 2,200 fatalities. This requires taking the Iraqi major's report of 1,400 killed in a single brigade as substantially exaggerated. However, the hypothesis would allow that more than half of the Iraqi troop deaths were concentrated in a handful of very unlucky (or very heroic) brigades and battalions. The rest would have learned -- as the coalition intended -- that it was better to quit than fight.

The hypothesis also allows that unit personnel attrition was proportionately lower in OIF than in ODS -- perhaps 1.6 percent *versus* 2.5 percent -- but that the attrition *rate* (percentage of personnel killed over time) was higher: 1.6 percent achieved in less than three weeks versus 2.5 percent achieved in six. This higher attrition rate -- 0.53 percent *on average* per week *vs* 0.41 -- could be attributed either to the increased reliance on precision munitions, the lack of a ramp-up period in the bombing campaign, or both.

Most important to understanding the contribution of ground force interdiction to the early, catastrophic collapse of the Iraqi field army is that these air attacks, concentrated in the second week of the war, may have cost the Iraqis 1 percent of their active fighters -- that is, 1,200 -- over a period of seven days beginning just one week into the war. Nothing like this happened early in Desert Storm. Moreover, with the attacks heavily focused on a minority of Iraqi units, they would have produced (and did produce) localized experiences of sudden and great devastation. This would have communicated throughout the force, both by word and by the fact of some units beginning to take flight, and could have had a cascading effect.

### Notes

1. *Operation Iraqi Freedom: By the Numbers* (Shaw AFB, South Carolina: CENTAF, Assessment and Analysis Division, 30 April 2003).

2. According to CENTAF's *Operation Iraqi Freedom: By the Numbers*, 15,592 aim points involved air interdiction of ground forces, close air support missions, attacks on maritime units, and support of special operations. Although *By the Numbers* does not further disaggregate this number, its presentation of planned and requested aim points suggests that somewhat less than 25 percent of the 15,592 aim points would have been devoted to purposes other than interdiction of ground forces. Our estimate that 20,000 bombs and missiles were used in attacking the Iraqi field army assumes that most of the war's B-52 strikes and most of the unguided munitions were used to this end.



**3. For some accounts of US aerial bombardment of Iraqi ground units, see:**

“Intensive US bombing targets Republican Guard: general,” *Agence France Presse*, 31 March 2003;

Peter Baker and Rajiv Chandrasekaran, “Iraqi Militia, Elite Forces Roll South Into Fierce Attack by US Warplanes,” *Washington Post*, 27 March 2003, p. 1;

Robert Burns, “Allied Air strikes Target Republican Guard,” *Associated Press Online*, 30 March 2003;

Patrick Cockburn, “Saddam's Army Retreats to Mosul with Heavy Losses; Northern Front,” *The Independent*, 3 April 2003, p. 4;

Phillip Coorey, “Half the Republican Guard eliminated and 'we're not finished',” *Daily Telegraph*, 1 April 2003, p. 2;

Bradley Graham, “U.S. Air Attacks Turn More Aggressive; Risk of Civilian Casualties Higher as Range of Targets Is Broadened, Officials Say,” *Washington Post*, 2 April 2003, p. 24;

Bradley Graham and Vernon Loeb, “An Air War of Might, Coordination and Risks,” *Washington Post*, 27 April 2003, p. 1;

Rebecca Grant, “Saddam's Elite In the Meat Grinder: Republican Guard divisions looked pretty bold until they got sliced and diced by coalition air power,” *Air Force Magazine* (September 2003);

Terry McCarthy, et al, “What Ever Happened To The Republican Guard? A *Time* investigation suggests most of the elite Iraqi forces survived the U.S. bombardment,” *Time Magazine*, 12 May 2003, p. 38; and,

Paul Richter, “Bombing Is Tool of Choice to Clear a Path to Baghdad; Heavy strikes are meant to grind down top-level forces before an assault,” *Los Angeles Times*, 1 April 2003, p. 1.

**4. Key targets of air interdiction included the Adnan, Al Nida, Baghdad, Hammurabi, Medina, and Nebuchadnezzar Republican Guard divisions. Among regular Iraqi army units, targets of substantial air interdiction included elements of the 6<sup>th</sup> and 10<sup>th</sup> armored divisions; 1st, 5th, 15th, and 51st mechanized divisions; and 11<sup>th</sup>, 15<sup>th</sup>, and 16<sup>th</sup> Infantry divisions.**

Although the personnel strength of the Iraqi military was often cited to be in excess of 400,000 prior to the war, scant evidence has been offered to support this figure. Certainly, there is no evidence to suggest that Iraq put an army of this size in the field to meet the Anglo-American invasion. The post-war testimony of Iraqi officers and the experience of coalition forces suggest an Iraqi field force of distinctly under-strength units. We accept no more than 180,000 as the number of regular army, Republican Guard, and Special Republican Guard troops who deployed for the war. This represents an Iraqi force only 70 percent as strong as implied by the official structure and organization of the Iraqi military. Moreover, fully one-third of Iraqi field units proved essentially irrelevant to the fight. Regarding Iraqi field strength, Anthony Cordesman concludes that “Estimates that most divisions had 50 percent to 75 percent manning and substantial equipment shortages seem to have been accurate...” Cordesman, *The Lessons of the Iraq War: Main Report* (Washington DC: CSIS, July 2003), p. 45.

Also see: Shlomo Brom, "The Strike against Iraq: A Military Overview," *Strategic Assessment* (November 2002), a publication of the Jaffe Center for Strategic Studies; and, Cordesman, *Iraq's Military Capabilities in 2002: A Dynamic Net Assessment* (Washington DC: CSIS, September 2002).

5. The *Gulf War Air Power Survey Summary Report* cites only 56.3 percent of strikes as having been directed at surface forces, but also notes that 15 percent of the strikes were uncategorized at the time of the study's completion. The authors conclude that "most of these uncategorized strikes were A-10, F/A-18, or A/V-8 sorties that, in all likelihood, were targeted against Iraqi ground forces" (Figure 12, p. 65). Taking this into account we adopt "more than two-thirds" as a conservative representation of the proportion of strikes directed at ground forces.

**Sources:** Thomas A. Keaney and Eliot A. Cohen, *Gulf War Air Power Survey: Summary Report* (Washington, D.C.: U.S. Government Printing Office, 1993), p. 65; and

*Gulf War Air Power Survey, Volume V: A statistical compendium and chronology* (Washington DC: Department of the Air Force, 1993), "Table 177. Strikes by AIF Categories," p. 418.

6. This counts guided bombs, anti-radiation missiles, air-to-surface missiles, and air-launched cruise missiles. In addition, sea craft fired 298 Tomahawk missiles and helicopters employed 482 Hellfire and TOW missiles. Eliot Cohen, director, *Gulf War Air Power Survey, Volume V: A statistical compendium and chronology* (Washington DC: Department of the Air Force, 1993), "Table 191. Desert Shield/Storm: Total USAF, USN, and USMC Weapons Cost and Utilization," pp. 533-544.

7. These are derived sums. The number of precision weapons used against ground forces is based on the number of precision strikes flown against ground forces (GWAPS, Vol. 5, tables 183 and 184, pp. 514-515) and the average number of weapons used per precision strike. The estimate was also checked for plausibility against the number of Maverick missiles employed in the war (GWAPS, Vol. 5, table 191, pp. 553-553), although other precision weapons were used against ground forces as well.

The total number of weapons employed against ground forces was estimated based on the number of sorties flown by different aircraft against ground force targets and the size and composition of their typical weapon loads (GWAPS, Vol. 5, table 185, p. 517; GWAPS, Vol. 4, Weapons, Tactics, and Training, "Chapter 2. Aircraft and Weapons"). Many of the bombs employed against ground forces were delivered by B-52s, which are known to have dropped 27,000 tons of munitions on these targets. An independent source of information on aircraft weapon loads is *GlobalSecurity.org* at [www.globalsecurity.org/military/systems/aircraft](http://www.globalsecurity.org/military/systems/aircraft).

8. Les Aspin and William Dickinson, *Defense for A New Era: Lessons of the Persian Gulf War*, Interim Report of the Committee on Armed Services, House of Representatives (Washington DC: HCAS, 30 March 1992), "Table I: Accounting for the Iraqi Army." Also see: Lt Col William F. Andrews (USAF), *Airpower against an Army: Challenge and Response in CENTAF's Duel with the Republican Guard*, CADRE Paper (Maxwell Air Force Base, Alabama: Air University Press, February 1998), especially "Appendix E. Iraqi Prisoner of War Comments."

9. In neither campaign were aerial attacks on Iraqi ground forces evenly distributed across the full duration of the campaign. In ODS about two-thirds of the air effort against ground troops (measured in kill-box strikes) was concentrated in a 29-day period that began 13 days into the 43-day war. In OIF, air

attacks on ground troops rose to prominence much more quickly. Nonetheless, about 80 percent of the air effort against ground troops occurred during a 15-day period beginning four days into the conflict. Thus, the impression that the attack on ground troops during OIF was compressed into about half the time of the ODS air campaign remains valid.

**Sources:** The figures on ODS were derived from the *Gulf War Air Power Survey, Volume V: A statistical compendium and chronology* (Washington DC: Department of the Air Force, 1993), "Table 180. Strikes by Day by Kill Box," pp. 466-467. The figures on OIF were estimated based on daily CENTCOM press briefings and campaign statistics compiled by GlobalSecurity.org.

CENTCOM briefings are available at:  
[www.centcom.mil/CENTCOMNews/transcripts/transcript\\_list.htm](http://www.centcom.mil/CENTCOMNews/transcripts/transcript_list.htm).

"Operation Iraqi Freedom -- Statistics" compiled by GlobalSecurity.org are available at:  
[www.globalsecurity.org/military/ops/iraqi\\_freedom-numbers.htm](http://www.globalsecurity.org/military/ops/iraqi_freedom-numbers.htm).

**10.** The cluster bombs used in ODS were the CBU-52/58/71 (quantity: 17,831), CBU-78 (209), CBU-87 (10,035), CBU-89 (1,105), and MK-20 Rockeye (27,987). The cluster bombs expended during OIF were AGM-154 JSOW (253), CBU-103/105/107 WCMD (908), CBU-87 (118), and CBU-99 (182) -- plus approximately 70 units dropped by the RAF.

**Sources:**

*Operations in Iraq: First Reflections Report* (London: UK Ministry of Defense, July 2003), p. 24;

*Gulf War Air Power Survey, Volume V*, "Table 191. Desert Shield/Storm: Total USAF, USN, and USMC Weapons Cost and Utilization," p. 533; and,

*Operation Iraqi Freedom: By the Numbers*, "Munitions Expended," p. 11.

**11.** The *Gulf War Air Power Survey* examined 12 representative sorties of aircraft employing PGMs with 12 sorties of aircraft using unguided bombs. The PGM sorties covered 26 targets using 28 bombs, while the unguided ones covered 2 using 168. This implies a ratio of 1:78 in bomb requirements, although the targets and levels of destruction achieved in the two samples may not be comparable.

Other studies of bombing accuracy in the Gulf War found that the best unguided methods achieved target destruction with 30 bombs (Hallion), while 2.2 PGMs on average were required to destroy a target with confidence (GAO). It should be non-controversial to conclude that laser-bombs allow at least a 15 fold reduction in bomb usage over the best unguided methods under battlefield conditions.

Relative to laser-guided bombs, present GPS-guided bombs -- which constituted about 50 percent of the PGMs used in OIF -- are somewhat less accurate. This implies some degradation in the bombing reduction allowed by PGM bombing versus "best method" unguided delivery. Of course, operational circumstances will not always allow the use of "best" (i.e. most accurate) methods of unguided weapon delivery. Under some circumstances, reliance on PGMs might allow a 40-fold or even greater reduction in bombing loads. Relevant to OIF, we accept 25:1 as a conservative mid-point estimate for the

reduction in bomb expenditure allowed by using a mix of PGMs versus using unguided munitions under a variety of circumstances.

**Sources:** “Entering the ‘Red Zone’ Q&A: Military Consultant John Pike,” *ABC News.com*;

John Pike, “What’s New With Smart Weapons,” *GlobalSecurity.org*, available at: [globalsecurity.org/military/systems/munitions/intro-smart.htm](http://globalsecurity.org/military/systems/munitions/intro-smart.htm);

General Accounting Office, *Operation Desert Storm Evaluation of the Air Campaign*, GAO/NSIAD-97-134 (Washington DC: GAO, June 1997);

Thomas A. Keaney and Eliot A. Cohen, *Gulf War Air Power Survey: Summary Report* (Washington, D.C.: U.S. Government Printing Office, 1993), p. 243; and,

Richard P. Hallion, *Storm Over Iraq: Air Power and the Gulf War* (Washington DC: Smithsonian Institution, 1992), “Appendix B. Battlefield Attack Technology,” especially “Appendix Table 2. Historical Trends in Bombing Accuracy.” Also see: Hallion, “Appendix E, The ‘Smart’ Bomb.”

12. Scott Peterson, “Iraq prepares for its defense,” *Christian Science Monitor*, 28 February 2003, p. 1; Kim Sengupta, “Iraq Crisis: Saddam’s Elite Troops Are on the Move, Says US,” *Independent*, 28 February 2003, p. 5; and, Robert Collier, “Scale of Iraqi strength is a mystery; No clear sign of military preparations,” *San Francisco Chronicle*, 20 January 2003, p. 1.

13. Richard J. Newman, “The Iraqi File: Long before they went into combat, US forces had gotten the goods on their Iraqi foe,” *Air Force Magazine* (July 2003).

14. Vivienne Walt, “Chaos ruled before Iraq’s military fell,” *Boston Globe*, 25 August 2003; William Branigin, “A Brief, Bitter War for Iraq’s Military Officers; Self-Deception a Factor in Defeat,” *Washington Post*, 27 April 2003, p 25; Mark MacKinnon, “Firepower broke Iraqi army, survivor says; Even vaunted Republican Guard wilted under overwhelming air, land assault,” *Toronto Globe and Mail*, 23 April 2003, p. 11; and, Carol Rosenberg, “Iraqi Military Commanders Told to Abandon Posts,” *Knight Ridder News*, 19 April 2003.

15. Terry McCarthy with Brian Bennett, Jim Lacey, Simon Robinson, Mark Thompson, and Michael Weisskopf, “What Ever Happened To The Republican Guard?,” *Time Magazine*, 12 May 2003, p. 38.

**16. Sources suggesting high rates of casualties among Iraqi ground units:**

William Branigin, “A Brief, Bitter War for Iraq’s Military Officers; Self-Deception a Factor in Defeat,” *Washington Post*, 27 April 2003, p 25;

Mark MacKinnon, “Firepower broke Iraqi army, survivor says; Even vaunted Republican Guard wilted under overwhelming air, land assault,” *Toronto Globe and Mail*, 23 April 2003, p. 11;

Scott Peterson and Peter Ford, “From Iraqi officers, three tales of shock and defeat,” *Christian Science Monitor*, 18 April 2003, p. 1;

Carol Rosenberg, "Iraqi Military Commanders Told to Abandon Posts," *Knight Ridder News*, 19 April 2003; and,

Jonathon Steele, "Body counts: The western media focused on the number of civilians killed in Iraq, but the country's ill-prepared armed forces suffered far greater losses," *The Guardian*, 28 May 2003, p. 19.

17. Harvey Rice, "Hundreds of elite troops killed; U.S. forces batter Saddam's divisions in battles, aerial attacks," *Houston Chronicle*, 4 April 2003, p. 25; and, Bryan Bender, US Says Two Divisions No Longer Pose a Significant Threat, *Boston Globe*, 3 April 2003, p. 33.

18. In the battle of Khafji, USMC units and units of the Saudi National Guard engaged an Iraqi battalion-sized unit in the city itself. However, Iraqi efforts to screen and reinforce this engagement involved elements of three divisions, and these were engaged principally by coalition air power. In the main "highway of death" incident, which occurred near Al Muttla, coalition ground units (the 2<sup>nd</sup> Armored Divisions "Tiger" Brigade and units of the 2<sup>nd</sup> Marine Division) did join the engagement, but only after intense air attacks had been underway for 5 to 10 hours. The second "highway of death" -- a narrower road that led east-northeast out of the Al Jahrah junction -- seems to have involved coalition air attacks only.

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