

Paying for Weight in Blood

The weight of a combat load can now be measured in casualties
by Capt Courtney Thompson

Mission accomplishment and troop welfare. These two objectives embody the purpose of every leader of Marines, officer or enlisted. At times, finding the right balance between the two can be challenging. In order to determine the optimal balance between the two, most decision-makers use their own judgment, which is rooted in their personal experience. But instead of relying on experience and judgment alone, leaders can—and should—now use data to assist in their decision-making process. By using data in conjunction with experience, leaders can more effectively find feasible solutions to complex problems, which will contribute to the Marine Corps’ success in highly contested environments.

In preparation for that future fight, the 2016 *Marine Corps Operating Concept* places a premium on “the GCE’s ability to conduct sustained, foot-mobile operations while bearing mission-essential equipment and personal protective gear.”¹ When it comes to determining a combat load, the optimal balance of weight and equipment can be difficult to achieve. This strive for optimality makes the combat load an ideal candidate for data-supported decision making.

Each piece of gear available to the warfighter provides a capability that either serves to accomplish the mission or enhance Marine survivability. This is the benefit of adding equipment to the combat load. But how much is too much? Studies show that increasing load decreases physical performance from 0.36 to 0.68 percent per pound for tactical combat movements.² Determin-

>Capt Thompson is a 1302 currently serving as an Operations Research Analyst at Operations Analysis Directorate, Combat Development & Integration.

ing what this performance decrement means on the battlefield is a separate problem entirely. Incorporating data collected from human-subject research into a combat simulation can provide some insight into the effect of combat load on casualties.

To investigate the performance impacts, a computer simulation modeled a 13-Marine rifle squad—using physical fitness and marksmanship data from active duty infantry Marines—engaged with a fire team-sized element (in a defensive position) from 100 meters carrying various loads. The squad responded by closing with and destroying the enemy through a series of buddy rushes over the exposed terrain. The simulation ran thousands of firefights to analyze three different loads. Both the fighting and assault loads were taken from the *Infantry Training and*

Readiness Manual (T&R Manual), and the average combat load was based on a 2017 Government Accountability Office report. When accounting for a rifleman’s weapon and ammunition, the fighting and assault loads amount to around 65 and 80 pounds,³ respectively, whereas the average combat load for Marines in Iraq and Afghanistan was 117 pounds.⁴ Since the model simulated loads in five-pound increments, casualty results pertaining to this actual combat load of 117 pounds were interpolated using the results from weights of 115 and 120 pounds (see Table 1).

The results show that a large proportion of the squad should be expected to become casualties in this type of engagement, which is not surprising considering the scenario: Marines fighting an enemy in defensive positions while significantly exposed. What is surprising is the relative difference in expected casualties between the combat loads. An increase in only 15 pounds, from 65 to 80 (fighting to assault load), results in approximately one additional casualty on average, per engagement. Even more profound, the difference in casualties between the fighting load (65 pounds)

Combat Load Weight [lbs.]	Squad Casualties	
	Average	Standard Deviation
65	9.3	3.01
80	10.1	2.84
115	11.8	2.03
120	12.0	1.93

Table 1. Simulation casualty statistics by combat load weight. Notes: The computer simulated each load condition 1,000 times. The standard deviation decreases as the number of casualties increases due to an upper bound of thirteen casualties.

and the average actual combat load (117 pounds) is nearly 3 Marines. Consider the impact these results might have on the new twelve-Marine squad configuration, which has less firepower than the thirteen-Marine squad. So why are the loads carried by Marines in combat so much heavier than the published standard loads?

The difference between the weight of a standard load and what is actually prescribed for Marines to carry in combat is at the commander's discretion. The T&R states, "The unit commander retains the authority to modify the actual load requirements based on their assessment of the situation."⁵ This means that as new technologies become available, the unit commander has a decision to make regarding the capability that a piece of gear provides and the risk incurred by carrying its weight. This difference in weight is the commander exercising that authority to modify the combat load. This authority requires each commander to balance both the technological capability and the human capability. Using their experience and judgment, commanders can decide what risks to take and what capabilities are necessary (see Figure 1). This is how commanders can better balance mission accomplishment and troop welfare.

This risk versus capability can be viewed through two different lenses: the commander's or the warfighter's. Increasing the number of capabilities given to the warfighter decreases the commander's risk. With a multitude of technologies available, the warfighter should have every possible advantage over the enemy, increasing their lethality and survivability. From the warfighter's perspective, every piece of gear added to the load without the removal of another only makes the load heavier, which reduces physical performance. The model data shows that the weight added in order to provide the warfighter with additional technological capabilities results in an increased risk to the warfighter, decreasing their survivability. In effect, *increasing the capabilities given to the warfighter decreases the capability of the warfighter.*

The DOD acknowledges the fact that combat loads are excessive. Former

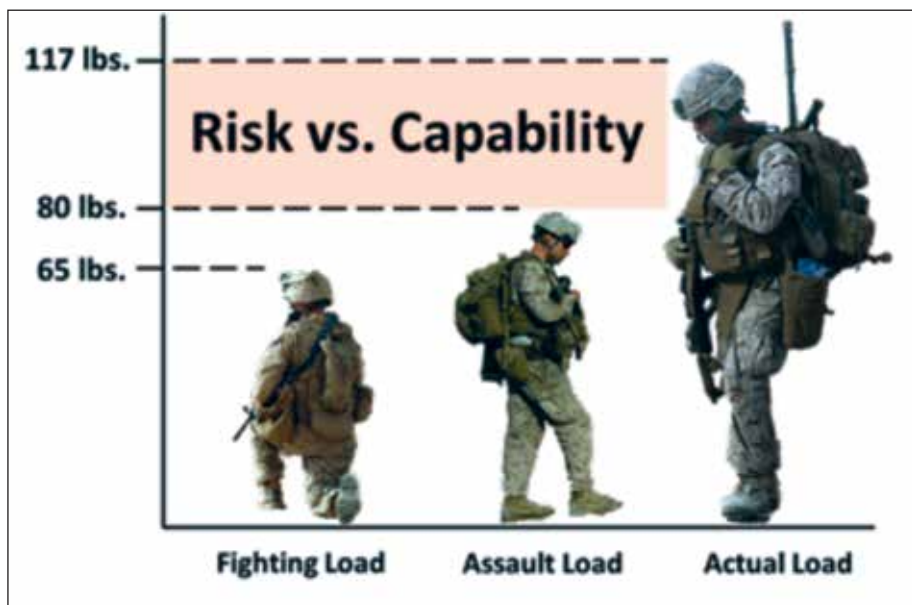


Figure 1. Weights of T&R standard loads and the average actual combat load in Iraq and Afghanistan. Note: The "risk vs. capability" indicates the weight from gear added based on a commander's assessment of the situation. This is where the commander determined that the gear added was mission-essential and worth the risk of increasing the load's weight.

Secretary of Defense James N. Mattis established a Close Combat Lethality Task Force focused on reducing infantry loads.⁶ Although both the Marine Corps and the Army are working to reduce the weight of personal protective equipment, most of the weight currently carried into combat is not from personal protective equipment but from additional mission essential equipment.

Therefore, the combat load must be reduced by taking a holistic approach. One solution is to reduce the amount of gear and equipment carried, scrutinizing what is mission essential. Another is to research and invest in lighter gear by incorporating weight thresholds into the DOD acquisitions process. If a piece of equipment is to be carried by a Marine, it must not only provide a specified ca-



Combat loads are excessive. (Photo by LCpl Leo Amaro.)

pability but also be as light as possible: “Every extra pound a Marine must carry decreases combat effectiveness.”⁷ Until the initiatives pushed throughout the DOD provide recommendations or introduce new policy, our warfighting institution has the opportunity, given to us by technology, to augment our decisions with data to find the best balance of mission accomplishment and troop welfare. We can give commanders at the forward edge of the battlespace the data they need to make the best situationally dependent decisions regarding combat load. This data can support the commanders’ understanding of how the combat load can both enhance and diminish the effectiveness and survivability of their Marines, empowering commanders to take more calculated risks. In turn, these calculated risks, backed by data, will improve the GCE’s ability to conduct the sustained, foot-mobile operations that are essential to the suc-

cess of the Marine Corps downrange.

As the Marine Corps advocates for more data-driven decisions and lighter combat loads, we have an opportunity to quantify the impact of weight on our Marines. This data enables our warfighting organization—from unit commanders to small unit leaders—to find a situationally dependent optimal balance of human and technological capabilities. However, it is now clear that if we fail to reduce the combat load, we will be paying for it in blood.

Notes

1. Headquarters Marine Corps, *The Marine Corps Operating Concept: How an Expeditionary Force Operates in the 21st Century*, (Washington, DC: September 2016).
2. Gregory Peoples, Aaron Silk, Sean Notley, Laura Holland, Brooke Collier, and Daniel Lee, *The Effect of a Tiered Body Armour System on*

Soldier Physical Mobility, (Wollongong, AU: University of Wollongong, 2010).

3. Department of the Navy, *NAVMC 3500.44C, Infantry Training and Readiness Manual*, (Washington, DC: 2016).

4. Government Accountability Office, *Personal Protective Equipment: Army and Marine Corps are Pursuing Efforts to Reduce the Weight of Items*

Worn or Carried in Combat (GAO-17-431), (Washington, DC: 2017).

5. *Infantry Training and Readiness Manual*.

6. Secretary of Defense, *Establishment of the Close Combat Lethality Task Force* (DTM-18-001), (Washington, DC: December 2018).

7. *Infantry Training and Readiness Manual*.

