CBU-87 and CBU-103

Performance explanation

For several years, the performance of the CBU-87 and CBU-103 cluster bombs, each with 202 BLU-97/B Combined Effect Bomblets (CEB), has performed worse than expected. As important weapons of the F-16C, F/A-18C, and A-10C, we re-examined the distribution of the CEBs and the weapon effect of each CEB to better conform with known data. We have made a number of changes that will make them more effective weapons, but it is important to understand how the weapon performs. They are not magic weapons.

You can expect to see these changes in an upcoming Open Beta update.

Eagle Dynamics Team

Our work has focused on four, key areas:

1) BLU-97/B Performance
2) Weapon settings and impact BLU-97/B distribution
3) BLU-97/B distribution patterns
4) Visual and audio effects

1 - The BLU-97/B CEB combines a shaped charge with limited fragmentation and incendiary effects. Whilst CEBs are ideal against unarmored, lightly armored, and personnel targets, they can potentially inflict moderate damage to armored units like a tank with a direct hit.

The chief concern was that the shaped charge element of the CEB was not inflicting the proper amount of damage when directly hitting a target. As we researched the issue, we discovered errors in the code concerning when the CEB detonates; the CEB detonation was happening too late and not properly damaging the target. This was isolated to the CBU-87 and CBU-103, which is why the AGM-154A JSOW CEB performance has been better, despite having few CEBs.

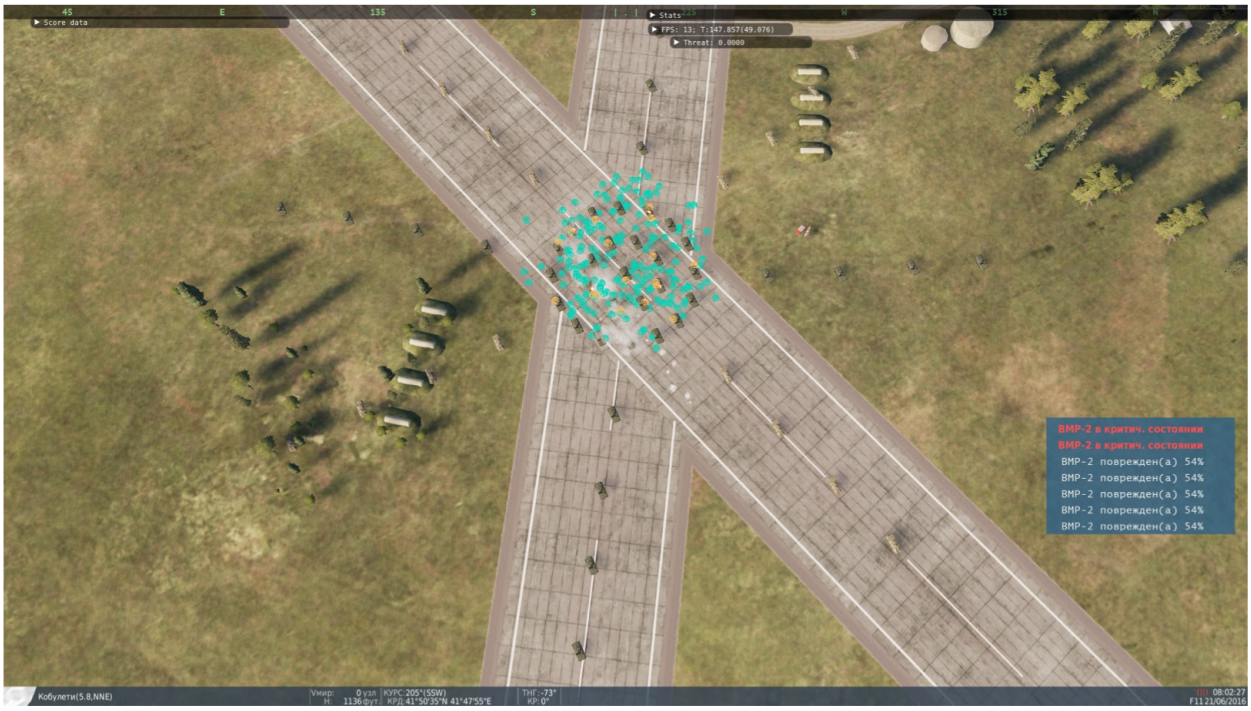
Once corrected, we saw a much improved CEB performance, even against light armor and older tanks like the T-55. Whilst not intended to be a tank killer (CBU-97 and CBU-105 have that role), it will have a better chance of damaging main battle tanks. It is important to understand that a damaged unit will have its mobility, reaction time, and weapon accuracy impacted.

2 - An important aspect of the CBU-87 and CBU-103 is the RPM the canisters will spin and the Height of Function (HOF) at which the CEBs are released. Both of these greatly affect submunition distribution. We ensured that high RPM and HOF values resulted in a larger distribution and lower values resulted in smaller, denser distribution. As such, selecting the right RPM and HOF will be important to match against your target.

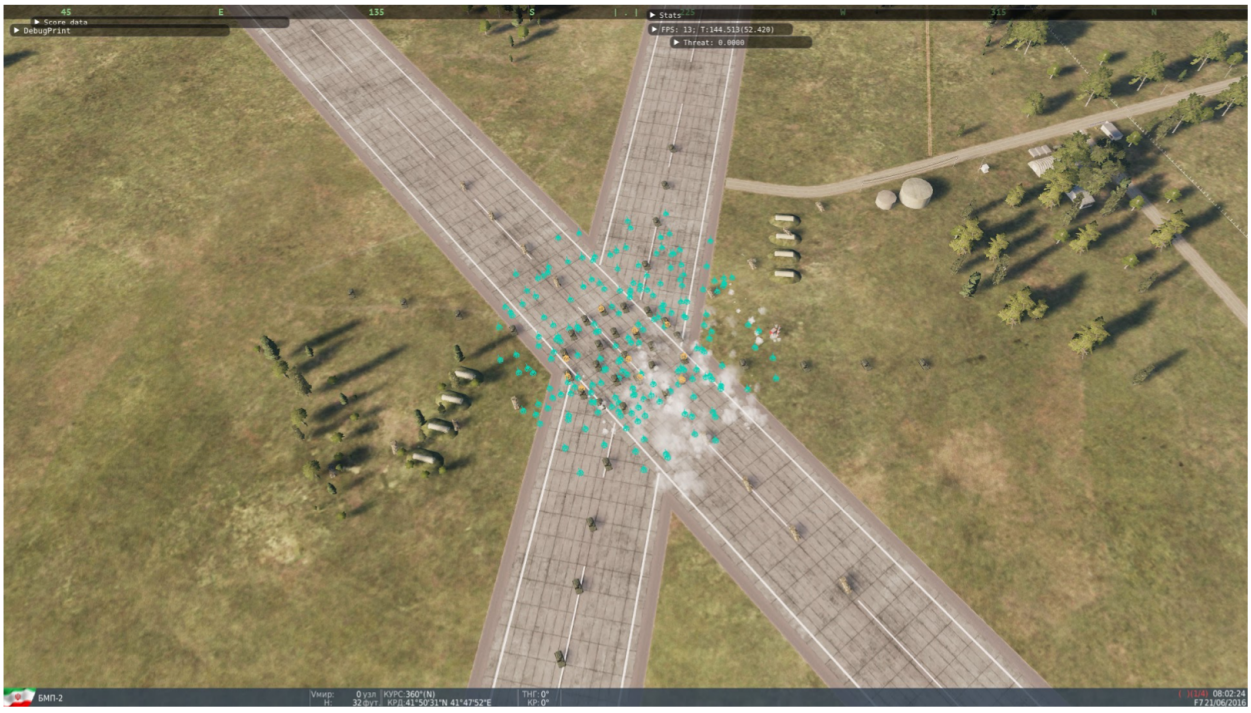
The following three images illustrate three possible patterns that are based on different RPM and HOF settings. Using our debug tool, each aquamarine circle indicates CEB impact location. All 202 CEBs are accounted for and their distribution is random within the footprint dictated by the RPM and HOF settings. Please note the graphical effect will not account for each CEB in order to maintain game performance.

1,200 ft. HOF and 2000 RPM

900 ft. HOF and 2000 RPM



1,500 ft. HOF and 2000 RPM



3 - The CEB pattern was the most difficult item to solve. However, based on open sources, we were able to get quite close to real-world CEB distribution. Within the total dispersion footprint, CEBs should generally be equally spaced. However, there may be dithering near the edge of the pattern.

If the targets are more spaced out, there is more chance the CEB will miss, and for most armored vehicles, this will mean little to no damage will be done. A shaped charge warhead requires direct contact with the target to damage it, unless very lightly armored.

In the next two images, a CBU-103 with a 900 ft. HOF and 2,000 RPM is targeted on a group of vehicles with different levels of target spacing. With more target spacing, there is greater chance of a CEBs not finding a target to impact. As noted above, CEB is random within the footprint defined by the HOF and RPM settings.

4 - Finally, we improved the visual effects in several ways:

a) Flashing or Z-Fighting: The current fire, smoke, and dust effects can suffer layering issues that result in flashing and other artifacts. These have been addressed.

b) Size vs Spread: We adjusted the footprint size of the effect based on the HOF and RPM settings.

c) Pattern Effects: The direction of the effects is now based on the flight path and drop conditions.

d) Canister Spin: The canister will now spin before releasing the sub-munitions at the set HOF.

e) Audio Issues: We are working on audio issues with these weapons, this is currently a WIP.

With these changes, you will see more realistic results when the weapon is employed correctly based on HOF and RPM settings matching the target area and desired CEB impact density. Thank you for your passion and support as we continue to refine and improve all aspects of DCS World.