Guided Weapons Tutorial for SF1/2/WoX Series

This is dedicated to the Forward Observers of Charlie Company, 1-26 Infantry. Without your hard work, we wouln't have been as successful as we were while in Afghanistan, thank you!

Needless to say, guided weapons nowadays are in more common use than the old "iron bomb". With cheaper and more reliable technology available, it has been made easy to retrofit older bombs with newer technology. While I could go on about this topic, it should be noted that this isn't a dissertation on those systems, only ways to use them in the SF1/2/WoX series.

Facts And Myths

Everybody likes to believe that any guided bomb will automatically just hit a point target, regardless of how it's dropped.

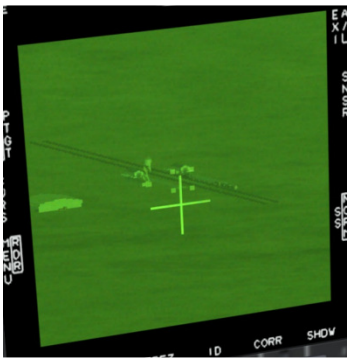
This screenshot shows the point I'm trying to make. This was a training mission that I will be using, in various guises to demonstrate guided weapons use. This is a GBU-38 JDAM I was attempting to use on a derelict T-55A. I thought I had a good drop angle and distance, but it's quite obvious that I missed. So despite the common belief, it is actually possible to miss with either a laser-guided bomb, or even as above, a GPS guided weapon. I will be going over optically guided bombs, such as the GBU-8 HOBOS, Paveway series, as well as the newer GPS guided munitions. Glide bombs will also be covered, even though realistically it really doesn't need to be completely covered. Other myths are that you can drop it anywhere, and that it'll hit regardless. Guess again. Guided munitions, like any munition, require near optimal trajectories and speeds in order to hit their targets. Unless it flies on its own, then it'll miss if you don't drop your bomb right.

The facts of course, are that they are very accurate when dropped within constraints. A real world facet of these bombs is lack of collateral damage. No need to train on carpet bombing, which in itself requires some degree of accuracy, when you can blow up a house without reducing the rest of the city, if that is your objective. The other benefit is that it saves on money, and the need to carry less. Why carry twenty bombs when only a few or even one can do the job, with better results? Plus you send a message to the enemy that you can strike him wherever you need to. Plus of course it looks better to the civilians, who need to be reassured that if you bomb them, you're reducing the chance of killing those civilians, and world opinion may not like the war. But then again it looks better if you're not going to kill everybody to destroy a power station.

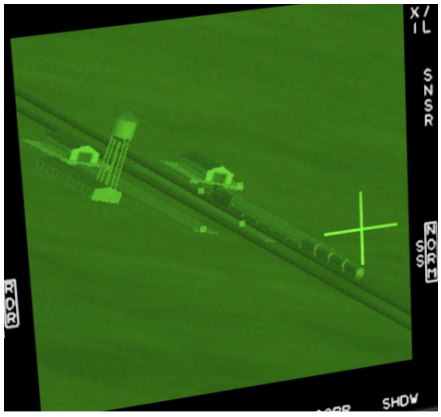
Targeting Pods

Without going into real world data about targeting pods, we'll discuss them for Strike Fighters. Essentially a Targeting Pod isn't really necessary in most cases if you are going to strike one objective. But then again, having a view of the objective, in a sense, helps you see as much as possible the effects of your drops. Then again, the SF series has always been good in positive feedback, i.e. "Callsign Lead, mission successful, RTB." Fine and dandy, but what if you want to engage additional targets with your precision munitions? Then you'll need a targeting pod. In most cases I take one when my mission requires me to use precision munitions. I still

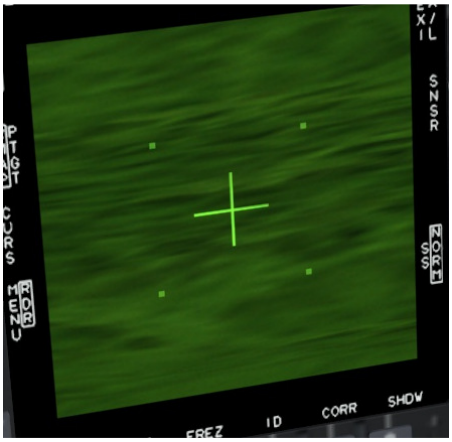
need to get back home and taking the time to use your precision munitions guarantees results. This is a typical targeting pod view in the MFD:



This is from the targeting pod mounted on the Gripen, the Litening III. Fairly typical of pods, this one uses the "four corners" method to track the target, and the "pointing cross" for the gimbal aiming display. What is most important to realize is the gimbal aiming display is what helps you orient yourself to the target. Going by the image above, I'm currently "left" of the target, so in order for me to be properly aligned, I have to center it.



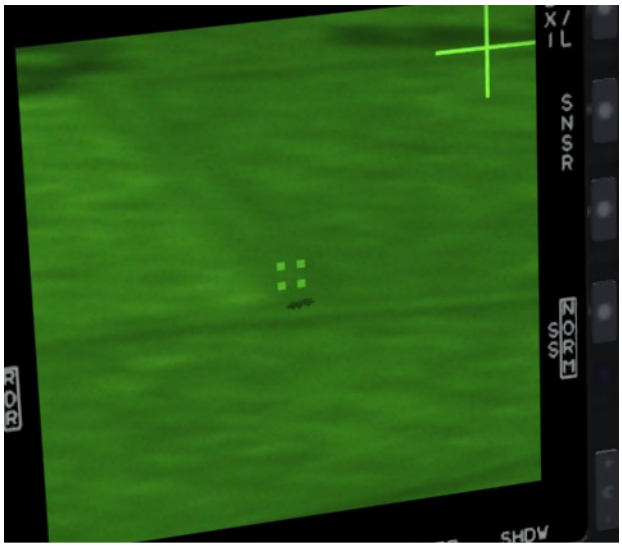
As you can see, I'm still banking to the left of the target, but this is a good indication of how the system works. And, once engaged, the display centers itself:



Note that the pod by default (if not locked onto a target) points forward and is not recommended for anything but something to look at, i.e. don't try and fly with it ;).

Laser Guided Bomb use

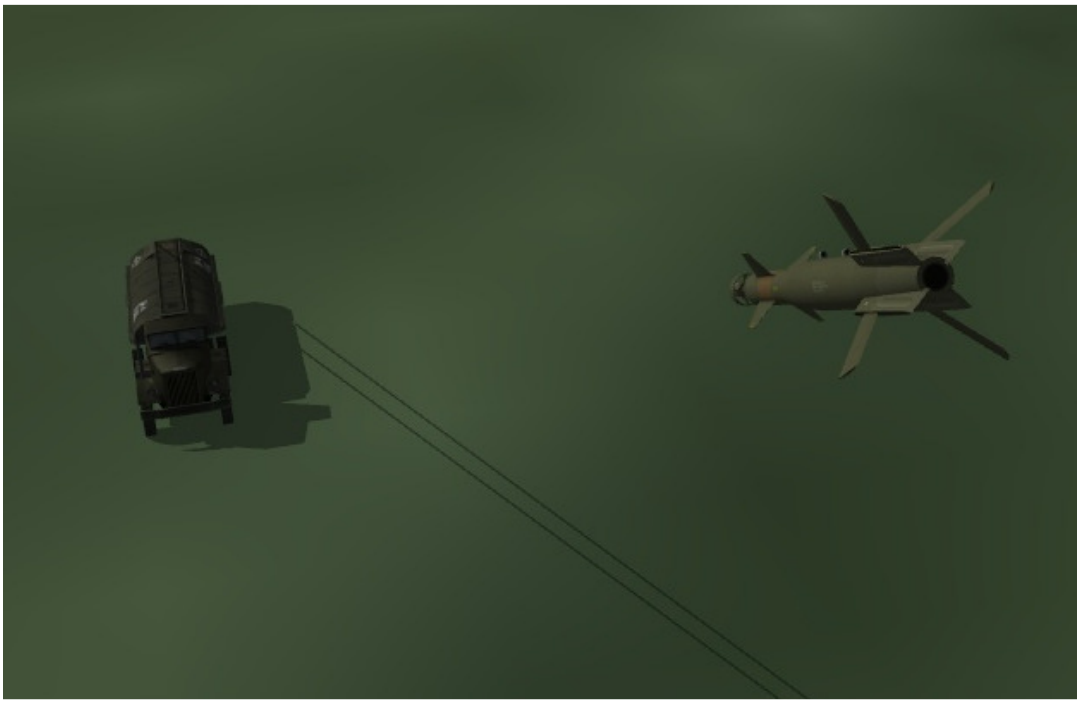
Now let's get out of the classroom, and into the pilot's seat. Today I'll be using the JAS-39C for this portion of the tutorial. I'll be loaded with two AIM-7Es and four GBU-12B/Bs and a Litening III pod. We'll have a set of targets for me to find and engage with the bombs. First thing I target is a Fuel Truck:



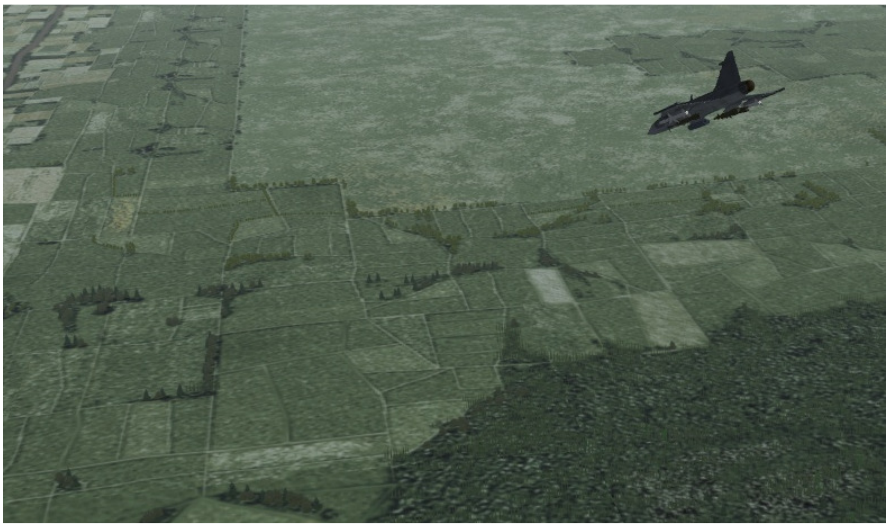
As you can see, I'm off to the left again, but that's okay, I'll get my target. Using F4 to padlock the target, I bring the aircraft around to engage. One thing that helps you get your nose oriented is, of course, the Padlock view, and also a targeting diamond that's projected on your HUD:

Now that we're aligned, I'm going to start off with a high altitude (7000ft or so) drop, using the pointing cross as my guide:

One of the reasons I'm relying on the cross is that I obviously cannot see the targeting diamond, and with padlock view it left me at this point. Here it gets a bit tricky, as you can see the cross is near the bottom of the screen. Depending on your rate of travel, this would ensure a good drop. With some aircraft it can be done right at the bottom, but this works with higher altitudes more than anything lower (above 10,000ft or so). Then we'll release at a semi-level attitude:



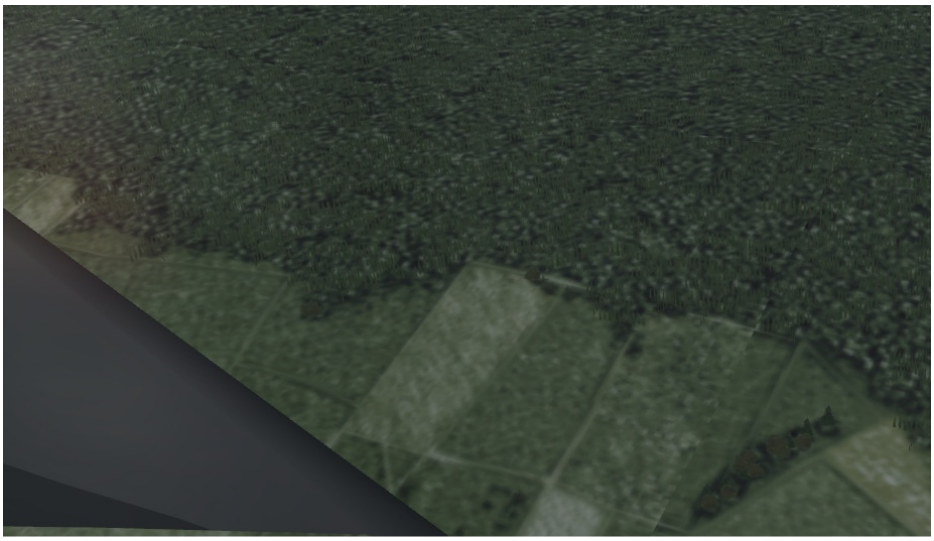
And we got a hit! It should be noted that the bomb (regardless of size) follows a ballistic profile, meaning once it comes off the pylon, it'll fly like a bullet to the target. While it's travelling, the fins orient the weapon in the terminal phase. Too close and it will overshoot, too far, and it will fall short. Makes some common sense right? Well, just like a regular ol' bomb correct? Distance plays an important part, and this is depending on altitude. The higher you go, the farther away you can drop the bomb from. Just like a real bomb correct? Told you there are some myths abound about guided weapons… Anyways, we'll move on to the next target, using a dive technique:



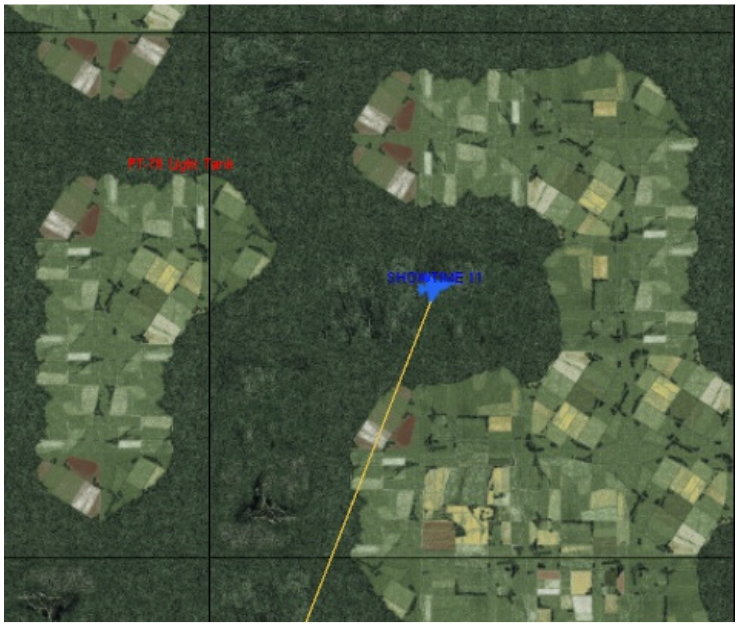
This one is fairly close, with the cross right on the four corners, and release:

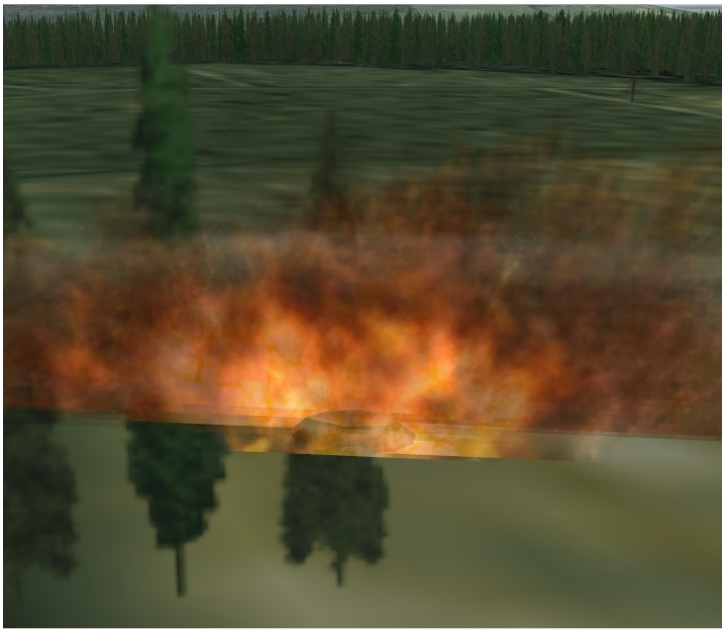
And…

As you can see, I hit the target. Now we'll takeoff for another flight and intentionally miss.



At the edge of this forest is a lone BMP-1, and at this point, I'm just passing it, so we'll release a bomb:


PT-76 Light Tank
SHOWTIME 11

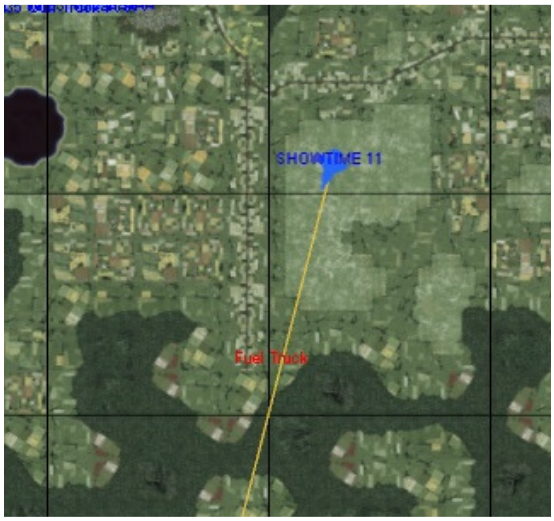


As you can see, the bomb continued forward and blew up some trees. This brings us to the next point, which is what the various bomb types require. As you saw, the GBU-12 is perhaps the most maneuverable laser guided bomb that you can employ, and has no problem destroying targets that you need to destroy, also it is preferable to most due to the light weight of the weapon. The GBU-16, only used by the US Navy, requires a little more constrictive envelope in order to be dropped, with only slight deviation in your flightpath when dropping this weapon. The GBU-10/24, are the two most restrictive weapons, due to the weight of 2000lbs. The first LGB, the GBU-2, falls in this category as well.

So let's take to the air and see how the GBU-10 series pans out:

For this demonstration I'll use the F-4E ARN-101 Phantom II. I have four GBU-10s, and one Pave Tack designator, which was first used during Operation Eldorado Canyon's strike in Libya, and subsequently used during the first Gulf War. Compared to the modern Litening III pod, the Pave Tack has very little in the way of cues, or in this case, none.

It has just a viewscreen to get eyes on the target, nothing more, so we'll have to use the tactical map to get properly oriented to our first target.



By the time I've taken this screenshot, I'm properly aligned, and from 7,000 ft, drop my first bomb:

Shack! As you can see, the GBU-10, when properly employed, can get results. Generally you don't use this against fuel trucks, but it is a training mission, so why not?

The above screenshot shows what not to do with a GBU-10, which is the product of using GBU-12s all of the time. I could have made this easily with a GBU-12 drop, but then again, it goes to show to take care when dropping ordnance:

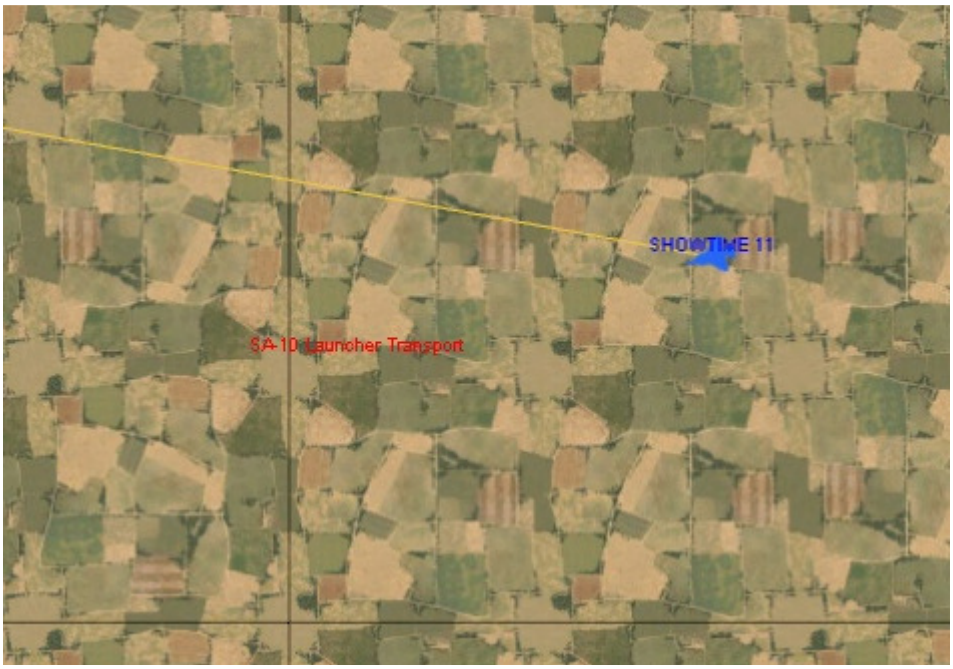
Coming around for a re-attack:

Moving Targets

Recommended only for the GBU-12, you can also engage moving targets with this weapon. The optimum recommended trajectory is either coming at the target from the front, or from the rear. For this we'll take to the sunny skies of South California and engage some tanks and other vehicles. For our first target, we'll engage a T-72:


517KTS
DIST
2.28NMLS
R ALT
4732FT
APU FIRE
FIRE
IFF TCN ILS D/L BCN CLR
ENT

When your aspect to the moving target is perpendicular to the direction of your nose, then you have to watch your distance when executing an attack. Begin your run in around six miles, and once you are pointing at the target, about three to four miles release your weapon. So far keep it medium to high altitude. Since most vehicles have a generic rate of travel, it is safe to assume that you will impart enough energy for the bomb to make the intercept. Do this only with GBU-12s, as show here:

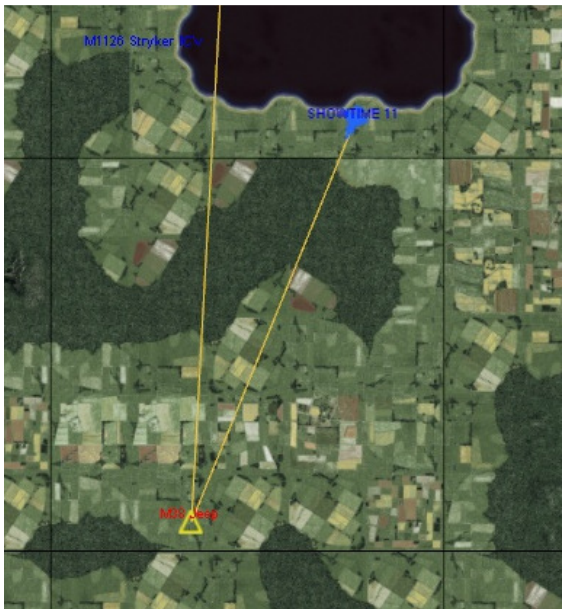


GPS Guided Weapons

The bulk of today's weapons is typified by the GBU-3x series JDAM, or Joint Direct Attack Munition. Quite honestly, it is the most widely used weapon in the US Military. Why? It is GPS guided that's why. You stick some fins on a dumb bomb, a GPS receiver in the tail, along with moveable fins, and you come up with one of the most accurate systems dropping off of pylons and out of bomb bays today. It has seen extensive use in Iraq, and Afghanistan, and is sure to be a commonly used weapon in the next war. What this means for you, the virtual strike pilot, is that you'll have an effective weapon for your needs.

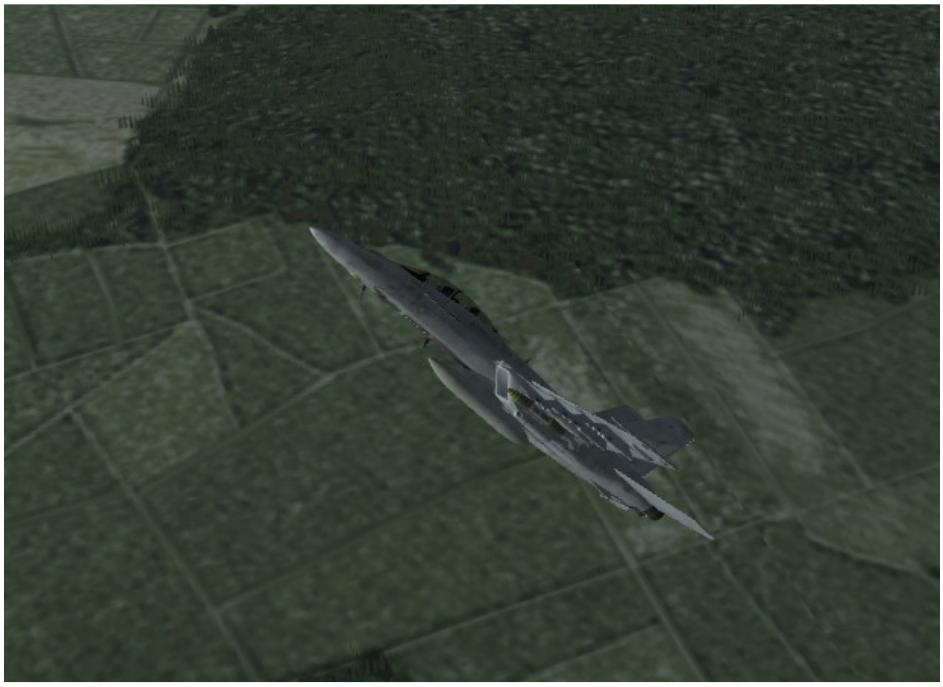
In the SF series, it is very abstractly modeled. First off, it can be used by any pylon that can accept the "EOGB" attachment. Second, if you don't have another optical system, like an LGB, which utilizes a camera, you won't see your target. Like the Pave Tack system described above, some dead reckoning, and liberal use of the F4 padlock. However, we're going to describe some high altitude bombing with the JDAM, as I primarily use this tactic in the Afghanistan map due to occasional bad weather. However, with the game coding in general, you can also perform the same tactic with LGBs. First you climb up to 10-20,000+ft:

Make sure “E” is pressed to “lock on” the target. You can fly a direct approach or you can offset by a few degrees, as I will show later on. Once you get roughly five to six miles (a square on the tactical map is roughly five miles), you can drop your ordnance:

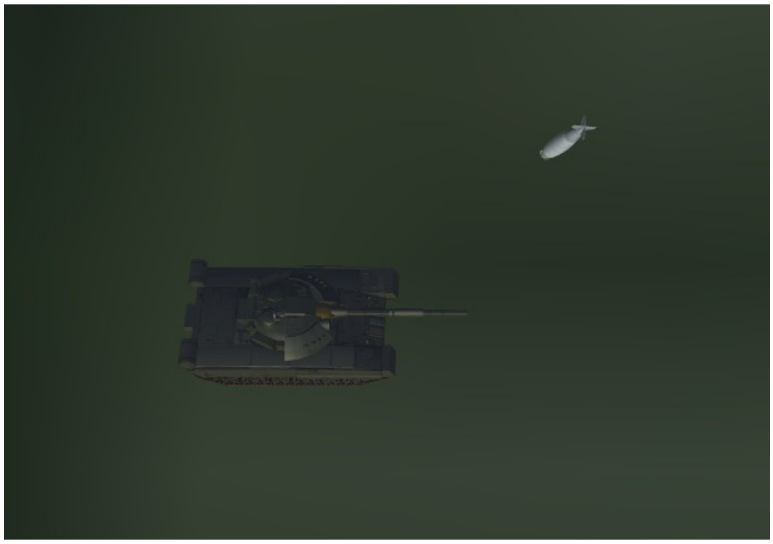


Needless to say, if you want to stay above SAMs threats or have a heavy cloud layer and really don't feel like getting down in the weeds, then this is the tactic to try out. You can also at this height drop at ten miles and still get a hit. You can even lower it down to 10,000ft and still get steel on target. These are things to think about and consider when you are trying to penetrate and avoid defenses at the site. However still with high altitude engagements, aspect and terrain are key considerations.

The best model so far is from the weapons pack done by 331Killerbee. It is the GBU-38 500-lb bomb. It's very maneuverable, and you can get pretty "crazy" with this, but as we saw at the start of the document, even you can even miss with this, but that to me is once in a very rare blue moon. I was searching for some more targets, and came upon this T-80BV that is just above my vertical stabilizers, so I nose up, and get some altitude, roll over, then drop:



Luckily I got some altitude so I was able to hit the target:

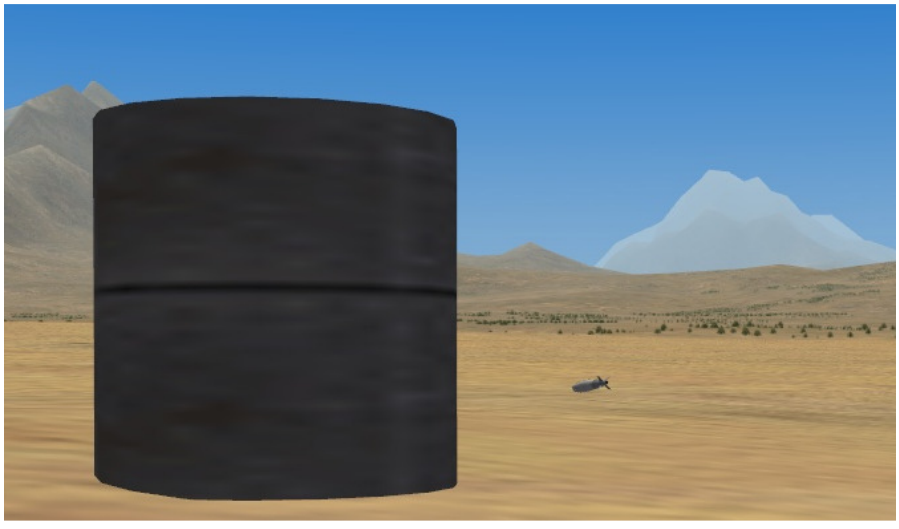


“Level” JDAM bombing

Another way to get bombs on target, if you’re like me, is to use a “level” bombing technique. I use the term loosely because in a sense it is a variation on toss bombing, but you are using your aircraft’s velocity and the lift features of the bomb to enable it to hit the target. To perform the maneuver is pretty simple, you head towards the target at high speed (500+ knots is recommended), then climb up to 2,000ft AGL once you are ten miles away:

Release the bomb:

Perform a break way maneuver to reduce the chance of enemy lock on by enemy SAMs, and let the bomb do the rest:

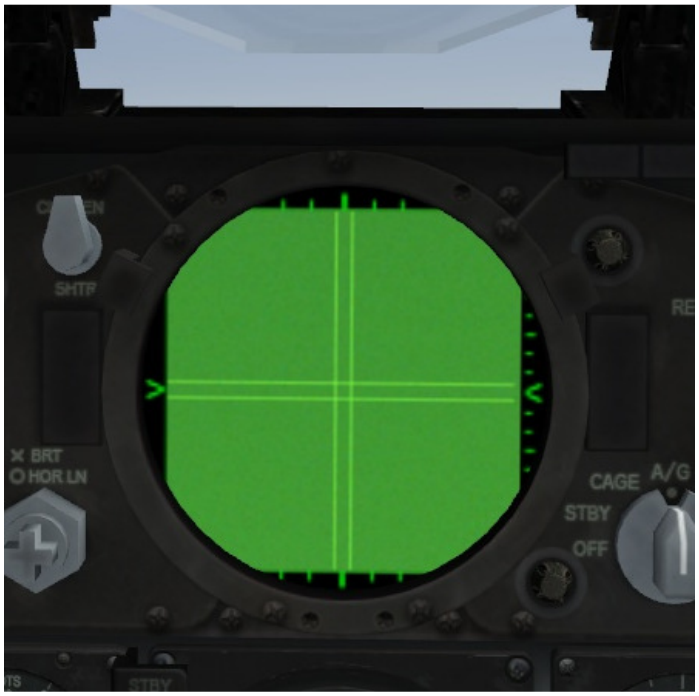


And if you did everything right, you should hit your target. The maneuver attempts to solve any height issues as it gives you an elevated launch angle. What it does not guarantee is that enemy SAM threats will not fire on you. It allows you to sneak in, and get your ordnance launched and hopefully hit the target. It should be made aware that you are somewhat vulnerable when you start climbing, and if you got your angle wrong, either you will hit the target, or you will hit something in "front" of the target.

Naturally I can go into more maneuvers for this weapon and its capabilities, but it really wouldn't be worth it. So we'll stop here and go into optically guided bombs.

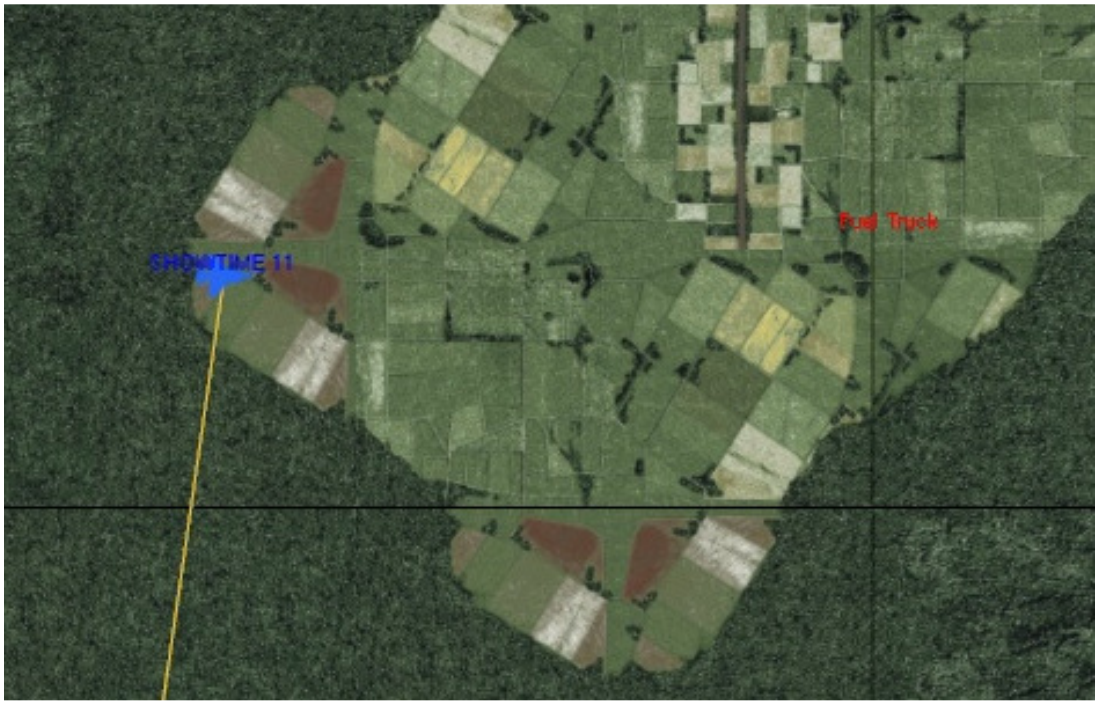
GBU-8 HOBOS

Used in the Vietnam War, the HOBOS (HOming BOmb System) was the precursor to the GBU-15 weapon system. It is accurate, but also not very maneuverable. So for you to engage targets requires you to fly as straight as possible towards the target, and roughly 5 to 8 miles away for the weapon to successfully home in on the target. Unlike the views above, this is what you will see in your MFD or in the case of the F-4G I'm piloting, a "crosshair" setup:

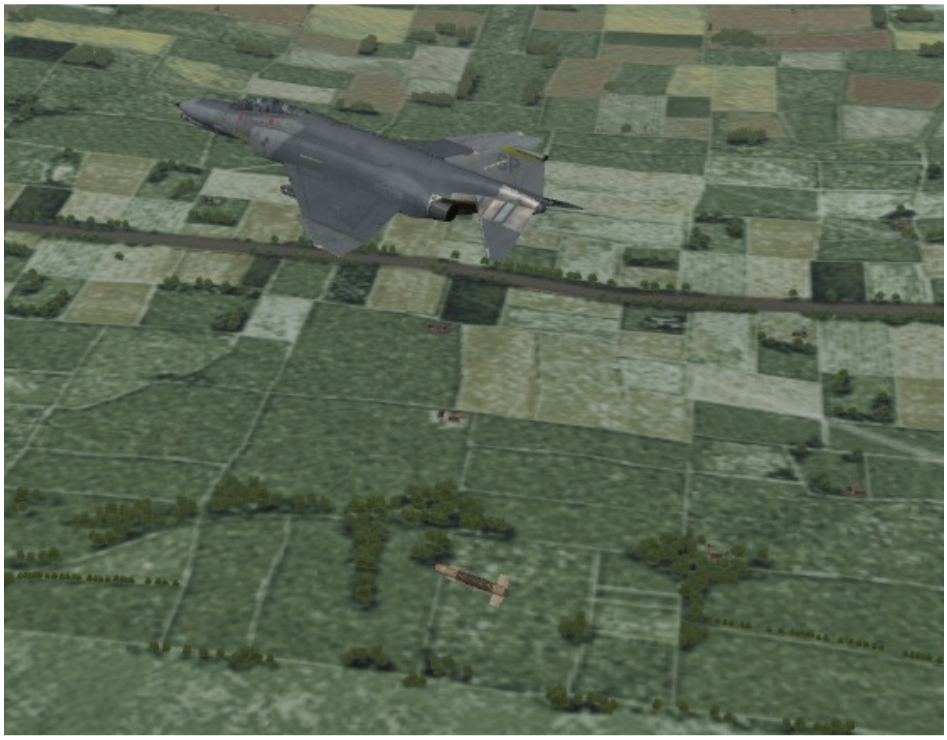


And once you acquire the target:

The lines will form into a box around the selected target. Unintentionally, I dropped the weapon far off to the left and short:



As you can see, I dropped “too close” i.e. about two to three miles away. Coming around again, getting some distance:



And as you can see… I got a solid hit. Generally speaking the higher and slightly farther you get away from your target, and with the most direct path to it, you will get successful with this weapon.

In conclusion, this is a pretty straightforward process when it comes to smart bombs. Despite what many people think, smart bombs are the future of world conflicts as they come. And it should go to say that this is only related to the game world of Strike Fighters, and no actual maneuvers, real or old, were used.

On personal reflection while working on this document, it's been said that smart bombs both revolutionize warfare (it definitely has), and also to the old hands, a "push button" style of warfare. To that I say by using smart bombs, or my Soldiers and I for a year in Afghanistan, that they are necessary. They are something that has to be accepted in life. I've had to drop a couple of bombs myself, and sure wouldn't depend on a pilot with iron bombs to accomplish the mission because my targets couldn't be engaged by a simple iron bomb. Both required precision drops, so while it was push button warfare, I still got both my targets serviced and did not have to wait on a pilot to adjust his aimpoint from his first ripple.

Eric Johnson

Questions? Comments? Concerns?
Contact me, EricJ at http://www.combatace.com

Mods Used:
Mirage Factory F-4E ARN-101
JAS-39C Gripen
331Killerbee's Weapons Pack
Anatolia Terrain WIP by pureblue
Strike Fighters 2: Europe with June 2009b patch
F/A-18F Super Hornet
Strike Fighters 2: Europe with Febuary 2010 patch.

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