Feature

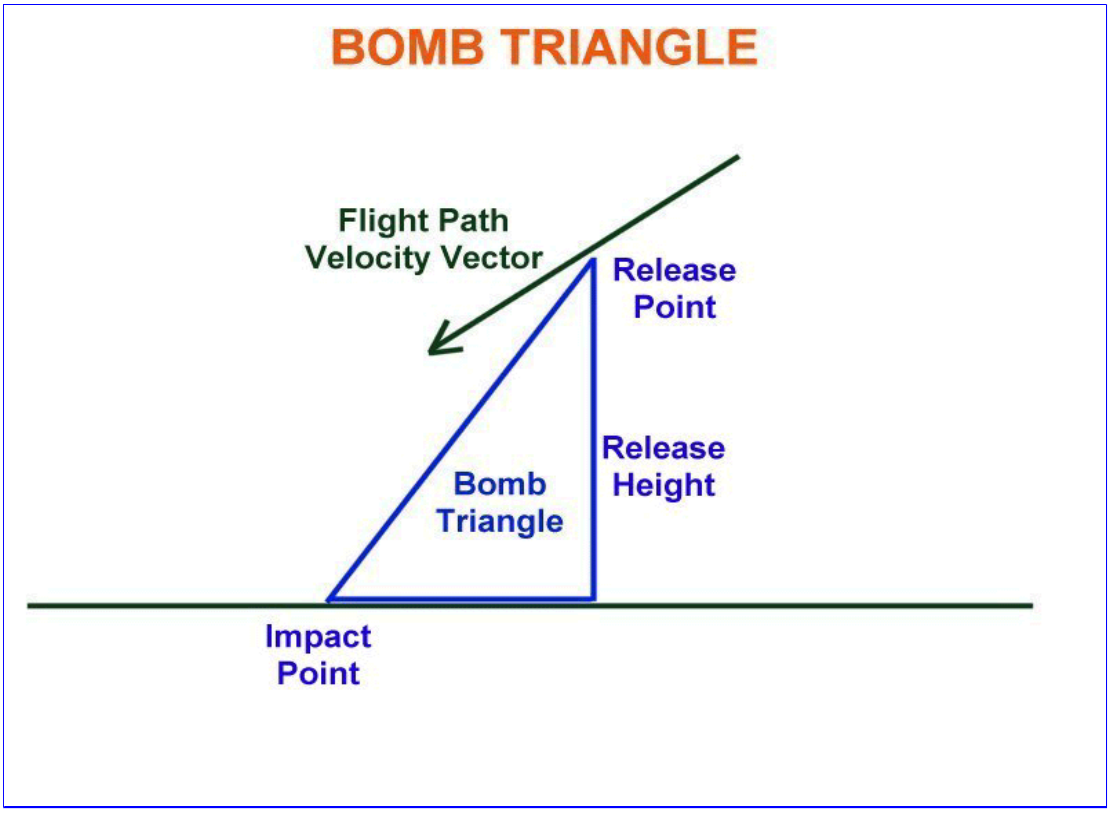
A-10 CCIP Bombing In LOMAC

by **Andy Bush**

Bombing Theory

None of the A-10 “bombs” are terminally guided weapons... they are all freefall “dumb” bombs, no different from weapons used since WW1. Once released, they follow a predictable trajectory until impact. The only thing that HUD designs have done over the years is to give the pilot a better idea of where the trajectory will end up.

So it is with the CCIP (continuously computed impact point). The idea is that “what you see is what you get”. Well... up to a point. Until the introduction of computer aided delivery systems, the pilot had to fly a planned set of parameters prior to release... because the path of the bomb was determined by the flight path of the releasing aircraft. These parameters were dive angle, airspeed, and release altitude above ground. This produced what we call the “bomb triangle” (below).



If the pilot was off his planned parameters, then the bomb simply did not go where planned. Flight path errors are categorized as long (past the target) and short (in front of the target). Go faster than planned or dive steeper than planned, the bomb goes long. Release higher than planned, all other things being equal, the bomb lands short. Use this next chart to see the results of releasing when not on your desired parameters. As you can see, minor variations can result in relatively large miss distances.

FUNCTION	AMOUNT	10°	15° LAB	20° LALD	30°
AIRSPEED	+20 KTS	58' L	37' L	109' L	63' L
	-20 KTS	64' S	86' S	114' S	85' S
ALTITUDE	+100'	77' S	49' S	61' S	27' S
	-100'	58' L	39' L	46' L	16' L
	+200'	15.7' S	105' S	122' S	51' S
	-200'	93' L	70' L	94' L	36' L
	+500'	525' S	311' S	330' S	123' S
	-500'	N/A	N/A	207' L	98' L
DIVE ANGLE	+5°	62' L	66' L	154' L	103' L
	-5°	286' S	186' S	308' S	189' S
BANK	2°	34' LR 16' S	30' LR 14' S	72' LR 29' S	43' LR 12' S
	5°	83' LR 44' S	73' LR 34' S	178' LR 78' S	105' LR 32' S
	10°	159' LR 95' S	140' LR 73' S	342' LR 170' S	205' LR 72' S
G-LOADING	+¼ G	33' S	33' S	74' S	49' S
	-¼ G	68' L	60' L	68' L	48' L

NOTE: L = Long Impact; S = Short Impact; LR = Lateral

Flying these planned parameters was not easy. Some fighter pilots learned the technique easily. Some never did at all. Most were somewhere in the middle... they could expect to “meet unit standards” but seldom took home the gunnery awards. The problem lay in their ability to fly the planned parameters... and their ability to recognize and correct any errors prior to release. This correction technique is called “error analysis” and involves the memorization of a number of general corrections to release parameters... such as adjusting the release airspeed to correct for a dive angle or release altitude deviation.

The CCIP concept was a tremendous leap forward... it, in effect, did the error analysis for the pilot as he attacked his target. The CCIP computer not only accounts for release parameter errors but also corrects for crosswinds. When it works correctly, it’s a wonderful thing!

But, as with many things in fighter aviation, there is a “yeah but”... and that is the existence of certain other factors that must be adhered to by the pilot in order for his attack to be successful. These are accounting for fuze activation time and the need to avoid the “frag pattern” created by the exploding weapon. We don’t want to kill the target and ourselves at the same time!

In real life, the A-10 CCIP has features that help the pilot recognize fuzing and frag restrictions... not so in this game, at least not right now. Before we get into that, let's take a look at the LOMAC A-10 HUD CCIP display in general terms.

CCIP Display

There are three main features of the bombing display... the flight path marker, the bomb fall line, and the bombing pipper.

Total Velocity Vector (TVV)

The TVV shows the point that your flight path is aimed at. This marker is also known as the flight path marker. If the TVV were pointed at the ground, that is where you would hit if you did not pull out. The TVV has nothing to do with the bomb... it strictly deals with the airplane. You can also think of the TVV as your roll axis, especially in one g flight. If you were to push the flight stick sideways, you would tend to see the airplane rotate around the TVV. In one g flight, the TVV is located near the top of the HUD, and so the top of the HUD becomes a good approximation of your flight path, particularly as an aiming indicator when rolling. Also note that the HUD display includes a small "gun cross" symbol near the top of the HUD. This gun cross is another excellent reference for your roll axis at one g.

Projected Bomb Impact Line (PBIL)

The PBIL is also known as the “bomb fall line”. When freefall bombs are released, they follow the flight path of the aircraft. When they hit the ground, they are still on that flight path (there is an exception for retarded (high drag) weapons that may be affected by winds during their fall... but that is beyond the scope of this article). As the aircraft flys along, you can imagine a line on the ground that represents the path of the aircraft. That line is what the bomb fall line in the CCIP HUD display represents. Ideally, the line shows the potential impact point for weapons released under the existing conditions of speed, flight path angle, and release altitude.

The PBIL will appear as a dashed line when the CCIP pipper is out of the HUD field of view (FOV). Once the CCIP is within the HUD FOV, the PBIL will change to a solid line.

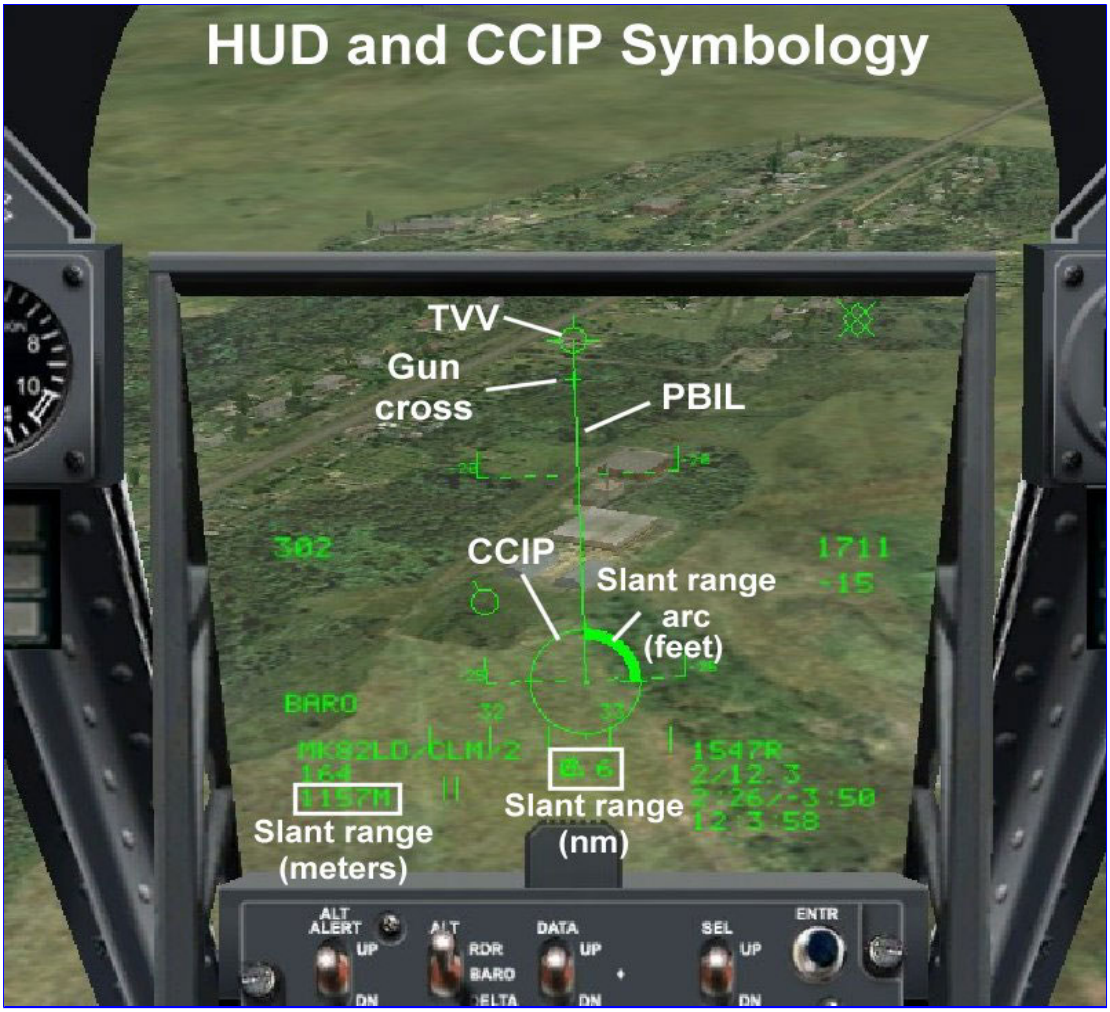

Dashed PBIL
Anytime the CCIP is not in the HUD area,
the PBIL will be displayed as a series of dashes.
Dashed PBIL
BARO
MK82LD/CLM/6
2358
4721M
9673
-17
ALT ALERT
UP
DN
ALT
RDR
BARO
DATA
UP
DN
SEL
UP
DN
ENTR

Dashed PBIL

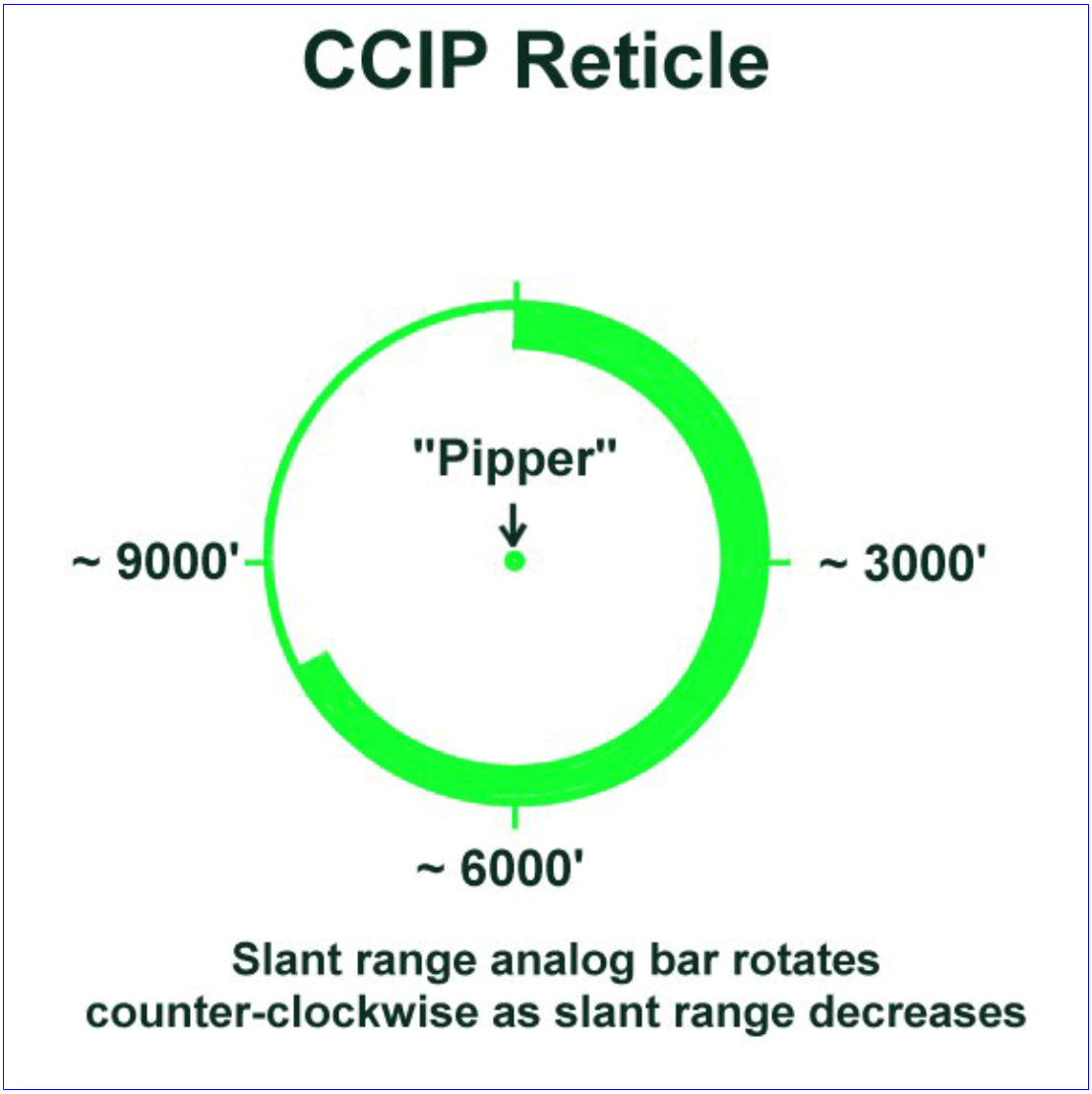
Solid PBIL

Release Pipper

The PBIL does not tell you when to release the bomb... it's only an indication of a future flight path, assuming your flight conditions do not change. What is needed is a symbol that says "if you drop the bomb NOW this is where it will land". That symbol is the CCIP bombing reticle and its center pipper.



The CCIP reticle in LOMAC is the same as the gun and rocket reticle and has three parts... the reticle, a range analog bar, and a pipper. The reticle is about double the size of the Maverick reticle and has a range analog bar that extends around the inside of the reticle diameter from about the 11 o'clock position counter-clockwise to the 12 o'clock position. This range bar remains at the max range position of about 15,000' (11 o'clock) until the slant range decreases below that value. The slant range shown in the CCIP reticle analog bar is the distance from your aircraft to the point on the ground under the reticle pipper.



The pipper is the dot in the center of the reticle. Common usage often has the term “pipper” used to describe the entire reticle display... one has to be careful how that term is used. Putting the “pipper on the target” may mean more than one thing... no problem! Just be sure what you mean when you use the word “pipper”!

Recommended Release Parameters

The CCIP function is intended to allow the pilot a little leeway in meeting airspeed, dive angle, and release altitude parameters. It is not necessarily intended to let the pilot fly willy-nilly anyway he wants when on an attack run. The system works best when you make an attempt to fly a planned delivery... if you are off a little here and there, the system corrects for these minor errors. The question then becomes one of what parameters should you attempt to meet. I’m going to go with real world data here and recommend the bombing parameters that we used in the Hog when I flew it in Europe. Below is a chart that summarizes the parameters.

COMBAT WEAPONS PARAMETERS (30,000', SL, 10°, 5sec final)

*MK-82LD

FUZE	TIME	DIVE ANGLE	(1) MODE	QUAN	MSEC X 10	(2) MILS	STICK	RELEASE ALT	RELEASE A/S	ABORT ALT*	PATTERN	DENSITY FT²/D'LET	ROLLOUT ALT	ROLLOUT A/S	ROLLOUT IPF	ROLLOUT AOD	BASE ALT	BASE DIST	Kw /KT	HW/TW MILS/KT	PODS PUF	PODS PULL DOWN	PODS APEX
N/T	4sec	15	S	1	-	204	-	1.3	325	1250	-	-	2.0	290	68	1783	2.4	7.5	8.7	1.2	-	-	-
			RS	3	19	210	120	1.6	325	1350	-	-	2.2	290	63	2358	2.6	7.8	10.0	1.2	-	-	-
				6	19	207	300	1.6	325	1450	-	-	2.3	290	68	2267	2.6	7.8	10.2	1.2	-	-	-
N/T	4sec	20	S	1	-	201	-	1.7	325	1550	-	-	2.6	285	60	1404	3.2	7.6	9.0	1.4	-	-	-
			RS	3	22	221	120	2.2	325	1700	-	-	3.1	285	59	2046	3.7	8.3	11	1.4	-	-	-
				6	22	210	300	2.2	325	1900	-	-	3.1	285	54	1954	3.7	9.5	10.7	1.1	-	-	-
N/T	4sec	30	S	1	-	167	-	2.2	350	2000	-	-	3.5	290	45	843	4.9	7.6	8.7	1.6	-	-	-
			RS	3	27	193	120	3.2	350	2400	-	-	4.6	290	45	1482	6.8	8.0	11.7	1.6	-	-	-
				6	27	181	300	3.7	350	2700	-	-	4.6	290	40	1389	5.8	9.8	11.3	1.5	-	-	-
N/T	4sec	45	S	1	-	132	-	3.3	375	3100	-	-	5.4	290	31	558	6.6	8.2	9.2	1.9	-	-	-
			RS	3	38	161	120	4.8	375	3500	-	-	6.9	290	29	975	8.3	7.2	12.4	1.7	-	-	-
				6	38	138	300	4.8	375	3800	-	-	6.9	290	25	882	8.3	7.4	12.7	1.6	-	-	-
MK-20 ROCKEYE																							
N/T	2.0	LVL	RP	6	28	202	-	3.3	390	300	550x 120	35	-	-	-	-	-	-	7.4	.6			
N	1.2	10	RS	3	23	359	-	0.6	325	550	320x 150	17	1.1	290	55	1131	1.4	7.1	6	9	8.4	.95	1.1
N/T	2.0	15	P	2	-	181	-	0.9	325	775	385x 120	20	1.6	290	64	1065	2.0	6.8	7	1.3	9.3	1.5	1.75
			RS	3	31	191	-	1.1	325	900	400x 125	47	1.8	290	63	2403	2.2	7.2	8.5	1.4	10.1	1.7	1.95
				6	31	169	-	1.1	325	1050	650x 115	36	1.8	290	51	1261	2.2	7.3	8	1.1	10.1	1.7	1.95
N	2.0	30	P	2	-	231	-	2.2	350	2000	200x 150	48	3.6	290	62	1319	4.8	7.5	11.5	2.3	-	-	-
N/T	4.0	30	RS	3	31	219	-	3.2	350	2300	400x 160	68	4.6	290	56	1667	5.0	8.5	15	2.1	-	-	-
				6	31	200	-	3.2	350	2600	700x 160	59	4.6	290	47	1532	5.8	8.7	14	1.9	-	-	-

NOTES: (1) S - Single, P - Pair, RS - Ripple Single, RP - Ripple Pairs. Pairs may be dropped for single and RP may be substituted for RS or vice versa, halve or double the quantity accordingly.

(2) + .7 mils / 1000# heavier / lighter

*(3) Assumes 5° steep or 20 KIAS fast - Altitude at which pilot must pickle, followed by a 45 in 5 sec escape, or he will: a. Frag Himself. b. Bad toe back. c. Hit the ground.

I'm putting these settings and parameters here for those that want to do it "by the book". Hit these dive angles and release altitudes and you won't have any problems with frag patterns or fuzing... although I'm not sure fuzing is an issue in LOMAC. For example, the Rockeye seems to always function at the same height above ground regardless of how high you were when you dropped it.

From the parameters, you can see that the data assumes a roll in either from a conventional base leg (low threat tactics) or a pop-up (high threat tactics). In either case, the release portion of the pass begins with you with your nose pointed in the direction of the target. This is where the next section will begin.

“Final” – The Attack Leg

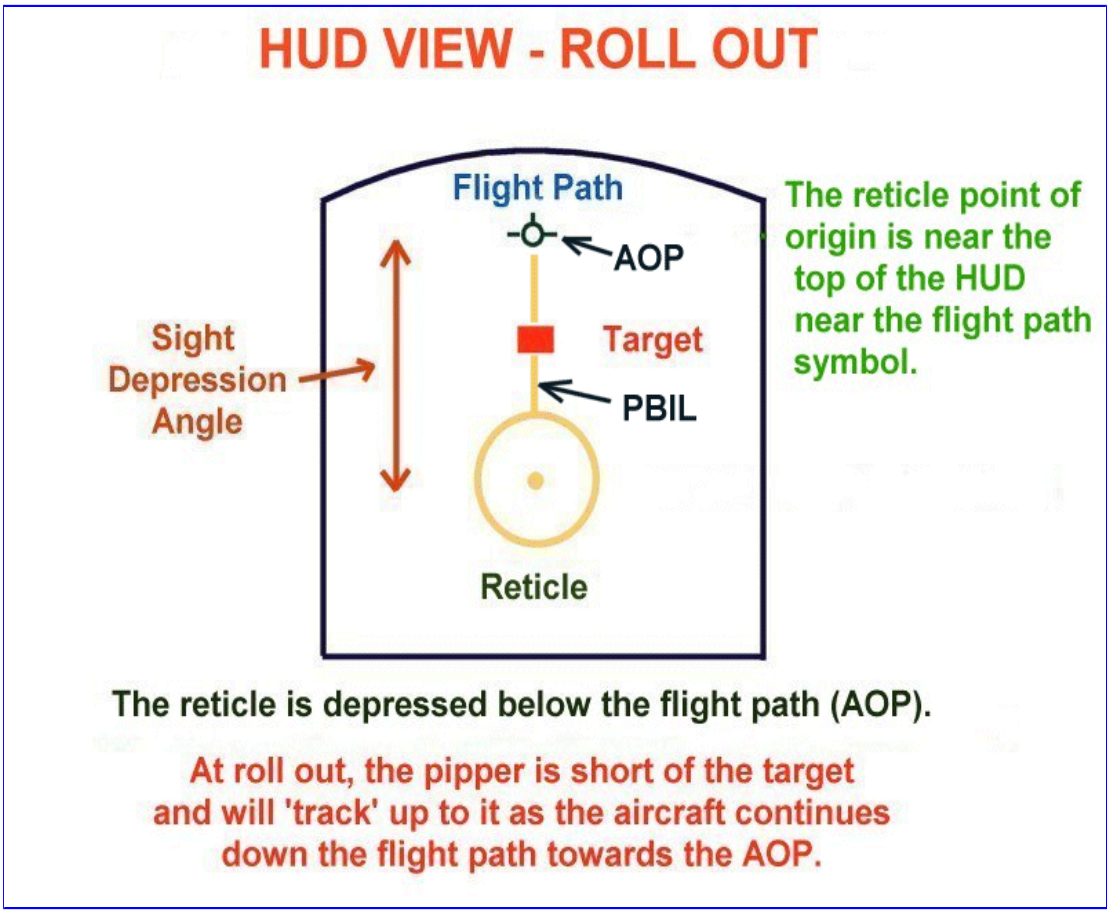
The part of a gunnery or bombing pattern where you maneuver to the release point is called the “final”... when you call “in hot”, you are beginning the final approach to the target. In order to assure accurate positioning of the pipper, the final needs to be relatively stable... but, to avoid getting blown away by the defenses, you need to keep the final relatively short... no more than five seconds from roll in to release. By the way, we call the release point the “pickle point”. Pickling off bombs means releasing them. Just a little lingo for your next LAN meet!

Way back when, I wrote a lengthy article on how to do A2G events. I won’t cover this material again here. If you missed this article and want to know the methodology of A2G weapons delivery, then please give it a look in our Air Combat Corner library.

Your Initial Aiming Point

Here it is plain and simple. Nothing has changed in free-fall weapons delivery in many a year. You must aim your nose past the target with your flight path running through the target (no wind). If there is a wind, you aim into the wind so that your flight path runs through your intended upwind aimpoint. Fortunately for us, the LASTE computer figures out the wind for us, so all we have to do is to get the PBIL to intersect the target.

The place that you aim your nose at is called the Aim Off Point (AOP). In a typical dive delivery, when you roll wings level, you want the AOP at the target’s 12 o’clock and the CCIP at the target’s 6 o’clock... and the PBIL should run from the TVV through the target to the CCIP.



It should look something like this. First, the general idea...

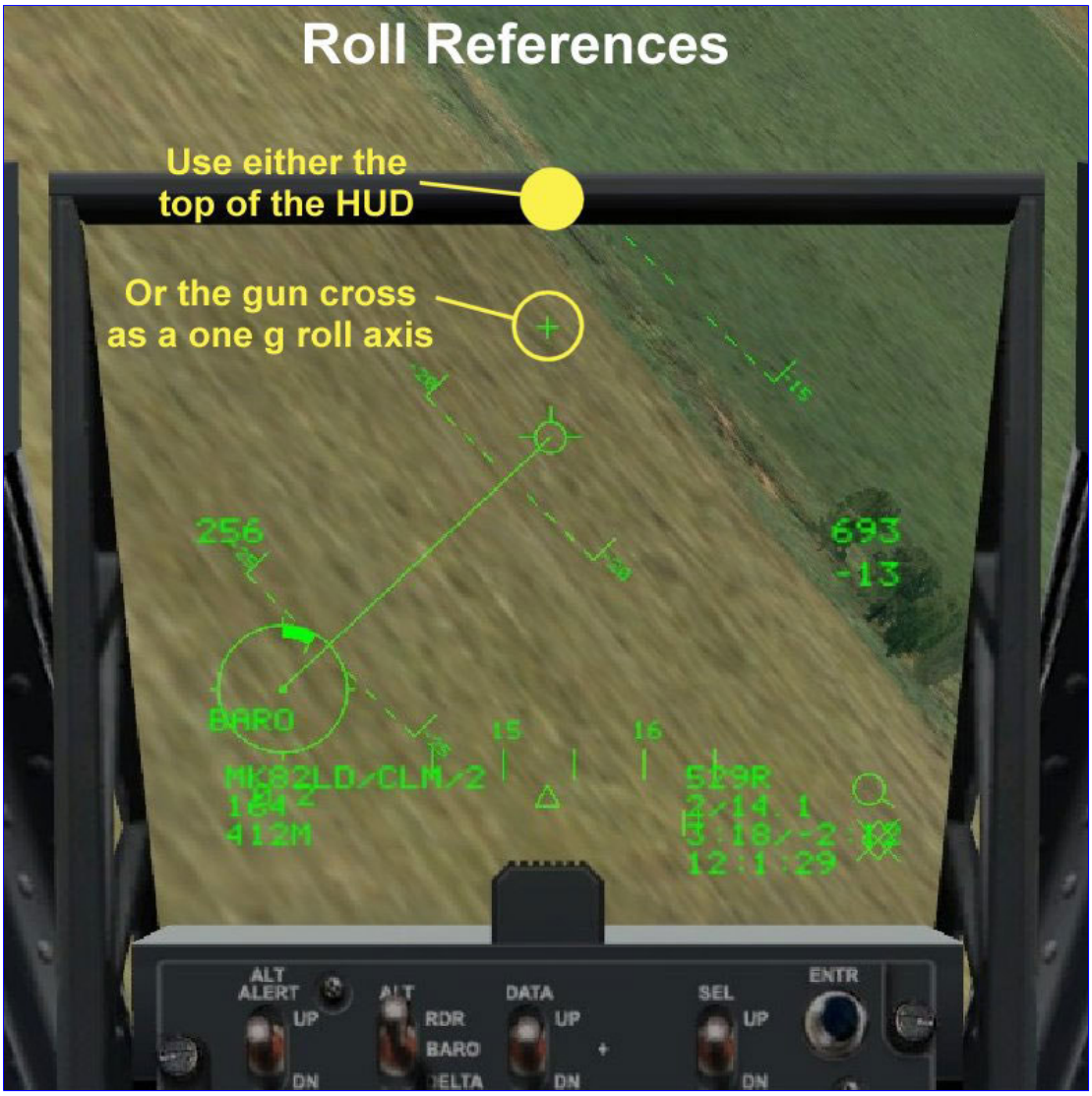
...and now what it looks like in the game.

At this point, you just continue in the dive and when the CCIP hits the target, you pickle. Easy! Piece of cake!

Errr... not so fast. Maybe it isn't that easy after all. Maybe a few techniques are in order to help things along. We'll begin with establishing the AOP.

The Initial Aiming Problem

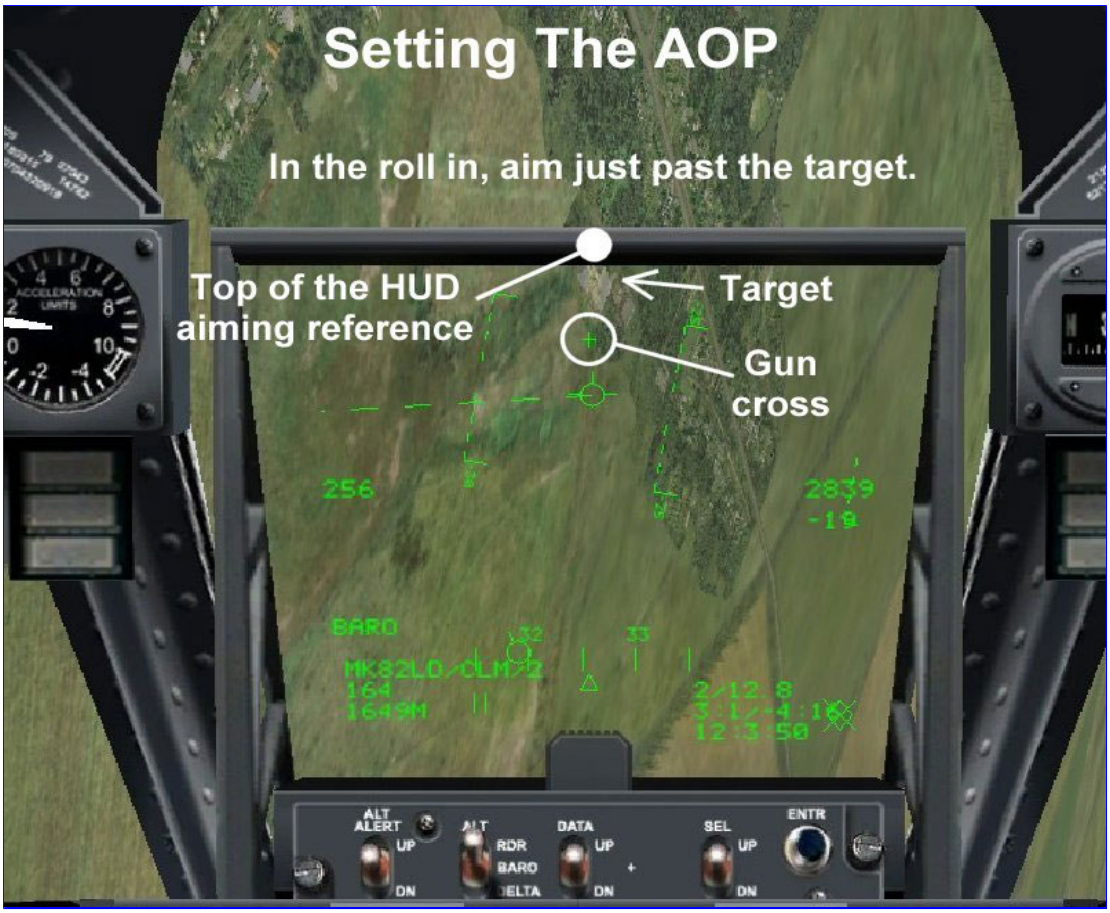
To aim with, we need an aiming reference. We have a flight path symbol... the TVV... but it isn't much good when we're turning or pulling g. We know when we are at one g that the TVV is pretty much centered in the top half of the HUD. However, when you pull g, the TVV moves down in the HUD, and in doing so, loses much of its value as a flight path reference. To replace the TVV when pulling g, I suggest you use the top edge of the HUD or the gun cross as your initial aiming reference when rolling into the dive.



When you roll in, disregard the CCIP, the PBIL, and the TVV. In your mind's eye, turn "off" that symbology and maneuver only with the top of the HUD/gun cross as a reference. This will help reduce pendulum effect (see the previous LOMAC Week article on HOG weapons for an explanation of pendulum effect).

Initial Aim Point

As you roll in, pull the top of the HUD/gun cross to a point on the ground just to the target's 12 o'clock. Keep the horizon in your peripheral view and visualize your flight path on the ground. Point the top of the HUD/gun cross along that flight path past the target.

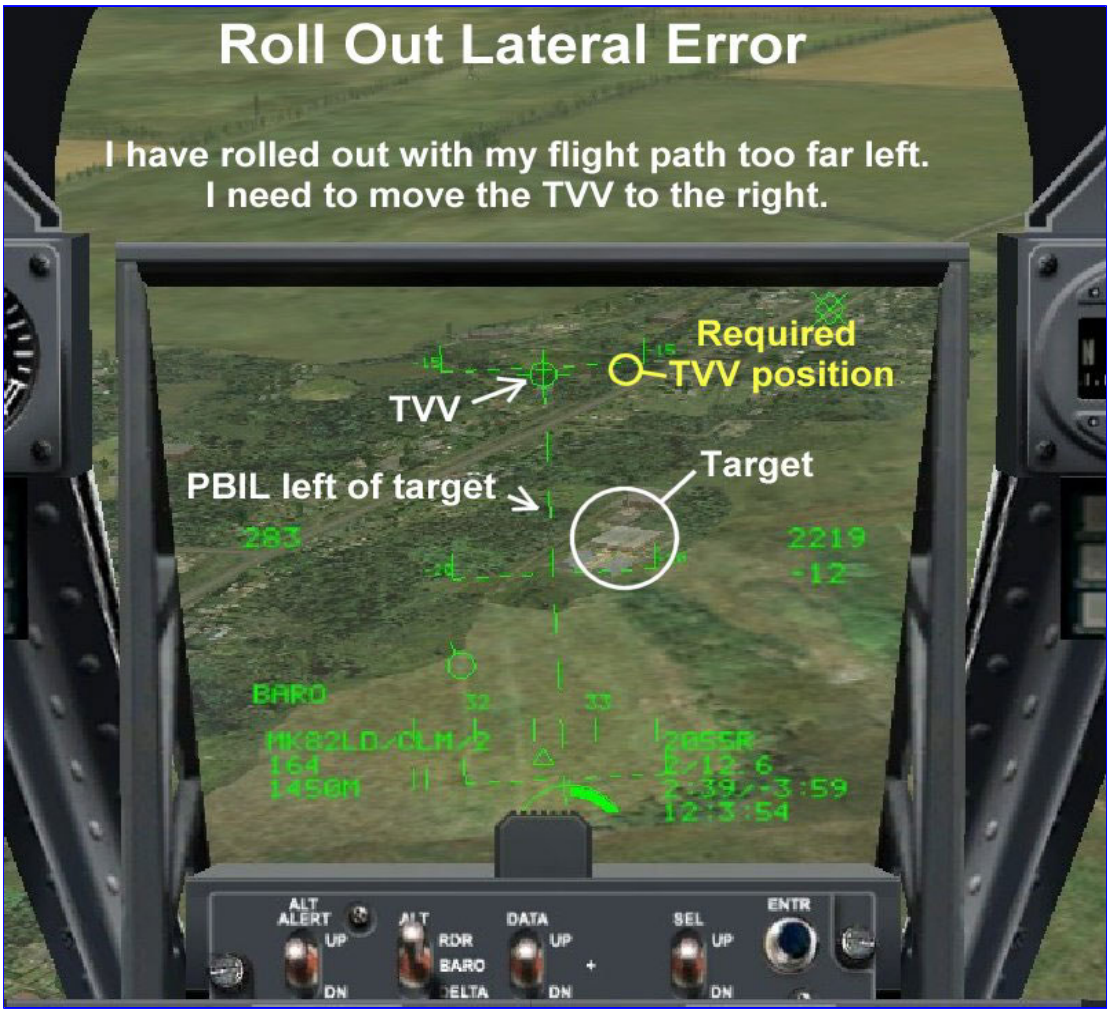


Pull the top of the HUD/gun cross to that point and then unload (relax backpressure to one g) and roll out. I want to put special emphasis on the “unload” part. It is easy to inadvertently maintain a little backpressure as you roll out. This will pull your nose away from your desired AOP. To avoid this, relax all backpressure on your stick and let the stick springs return the stick to neutral... then apply side pressure only to roll. Unload, then roll!!

Correcting The Initial Aim Point

As I roll wings level, I keep the AOP past the target. Now bring the PBIL and TVV into your cross check. Is the PBIL extending down from the TVV through the target? If not, note the lateral spacing error (the distance that the PBIL is away from a line extending from the target’s 6 o’clock to its 12 o’clock). Next, roll into a low bank angle... 10 - 20 degrees is fine... and begin a slight turn to move the TVV a distance sideways equal to the lateral spacing error.

In this shot, you can see that I have rolled out with the PBIL left of the target.



To correct for this lateral error, I roll into a slight right bank and ease the TVV over to the right... and watch the target to make sure I line up the TVV with the target's 12 o'clock.

In the image below, note that the PBIL, even though dashed, is running down through the target.

Then roll wings level and recheck your PBIL to see if it is now running through the target. If it is, great! If it isn't and you see a need for a second correction... don't! At least not yet! We've got bigger fish to fry right now! We need to establish the desired dive angle.

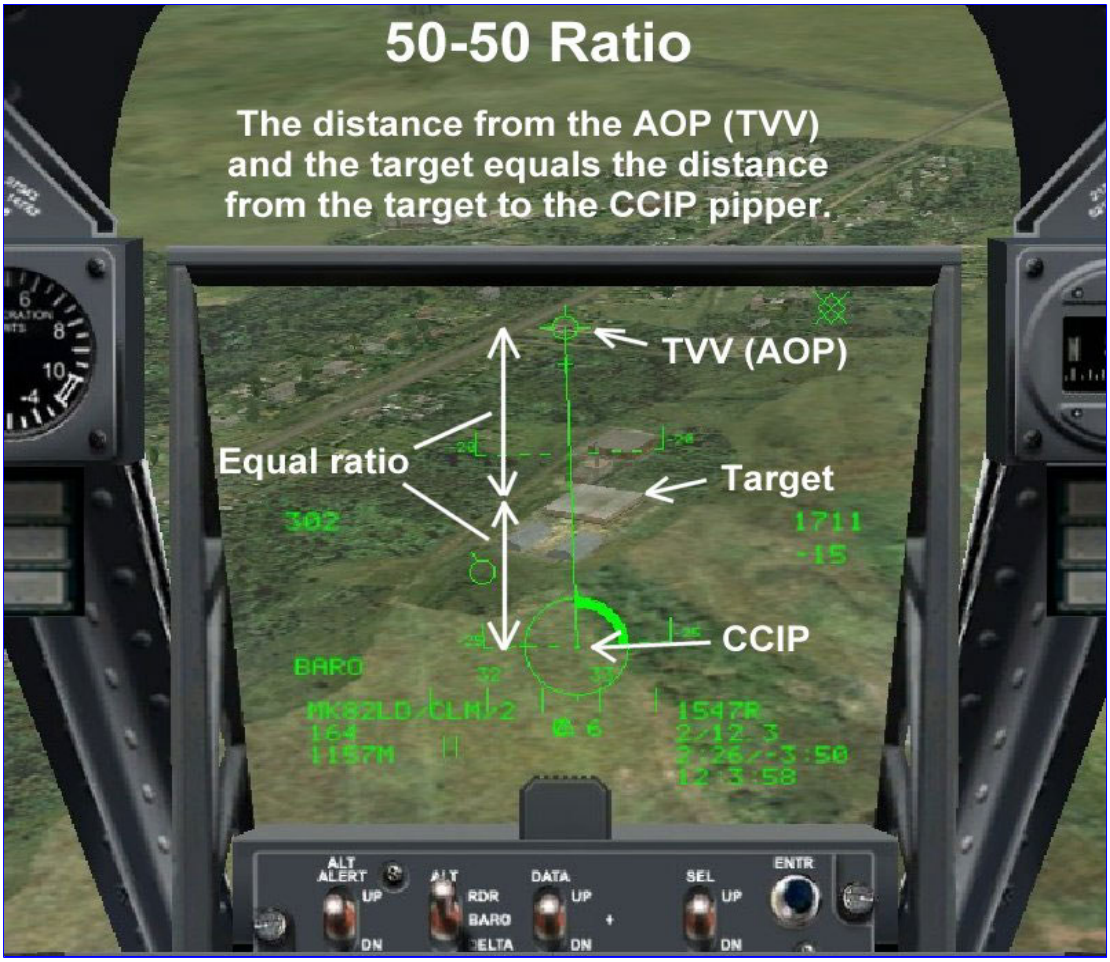
Getting On The Desired Dive Angle

If you used the base leg or pop-up parameters in the figure above, you should be pretty close to your desired dive angle. Once again... why is this important? Because in real life, fuze activation, altitude lost in the pull out, weapon function altitude (for CBU), frag pattern deconfliction, etc all depend on you "being on parameters". In LOMAC, this is not such a big deal. I mention this only to pass along real world need-to-know for those would like to know!!

OK... back to the bombing pattern. Here we are with the top of the HUD aimed past the target... and we've adjusted our PBIL so that it runs through the target. Now we need to adjust the AOP-target-CCIP ratio to meet our expected release altitude.

What I want you to do is to now raise or lower your nose slightly, keeping the wings level so that you do not turn. As you move your nose, the TVV will move up or down and the CCIP will as well. Our objective is to reposition the AOP so that the TVV, target, and CCIP are arranged so that the distances between them form a ratio where the distance from the TVV to the target is about equal to the distance from the target to the CCIP. I call this the 50-50 AOP-target-CCIP ratio.

In our example at right, this is what the new AOP "picture" looks like after I reposition my nose.



Technique... I tend to roll out with my AOP close to the target. As a result, my typical repositioning is one of raising the nose to get the 50-50 ratio. I find that I minimize lateral errors by aiming initially just past the target, rather than at a point further along the target's 12 o'clock axis. Ultimately, it doesn't really matter as long as you stick the target half way between the CCIP and the TVV.

Why a 50-50 ratio? For one thing, that relationship is typical of real life parameters in a number of situations... and it is easy to visualize. Secondly, this ratio helps establish a final where you are more likely to release on parameters... meaning the desired release altitude.

What effect does this ratio concept have on release altitude? Simply this... the closer the CCIP is to the target, the sooner it gets there. Assuming a valid computer computation, the sooner the CCIP reaches the target, the higher up you pickle. This may or may not be good, depending on weapon type. In real life, CBUs are meant to function at a specific altitude in order to get the desired pattern density... pickle too high and the weapon canister opens up too soon, spreading the bomblets out over a wider area.

Also, earlier release altitudes mean greater release slant ranges... and this tends to increase potential miss distances. Accuracy varies with release slant range... so, long range releases have to be carefully considered, particularly when attacking point targets.

Conversely, if the CCIP-to-target distance significantly exceeds the target-to-AOP distance, then it will take longer for the CCIP to "move up" to the target. All the while you are in your dive... so the potential exists for excessive altitude loss prior to release. Attendant with this altitude loss is the very real possibility that the weapon fuze may not have enough time to activate, resulting in a "dud"... or if the weapon does explode, you may be too low to safely escape the frag pattern.

So... be a good bomber! Don't pickle too high... or low! Fly the parameters I've listed!

All right... enough of the preachin'! Back to our bombing example!!

Tracking The Target

We are now in the final stage of the pass prior to release. We've set our AOP-target-CCIP ratio, and we're now "coming down the chute". Your work is not yet done... you have several things to watch. One is AOP placement, one is your airspeed, and the last is the effect of winds.

It is important that you maintain a constant AOP. Once you have your sight picture ratio set, look at where the AOP is on the ground. The TVV is your AOP reference. As you continue the dive, work hard at keeping the TVV on that spot. The TVV may move laterally or vertically (typically up). Lateral movement is usually the result of changing crosswinds or a rudder that is out of trim. Vertical movement is usually the result of changing pitch trim.

Rudder trim is very important... do a trim check as part of your fence check... trim the rudder neutral at your desired release speed.

Changing crosswinds can cause the PBIL to move left or right of the original line. You correct for this by turning away from the movement... if the PBIL moves left, make a shallow right hand bank to bring it back to the desired line. It may so happen that you have to maintain the bank right up to the release point. This is OK... the computer can hack a banked attitude as long as the bank angle is relatively constant (no abrupt changes just prior to release). As long as you can see the CCIP (the PBIL is a solid line), you have a valid release solution.

Here I am "fine tuning the PBIL by using a slight bank to drift the PBIL over to the center of the target building.

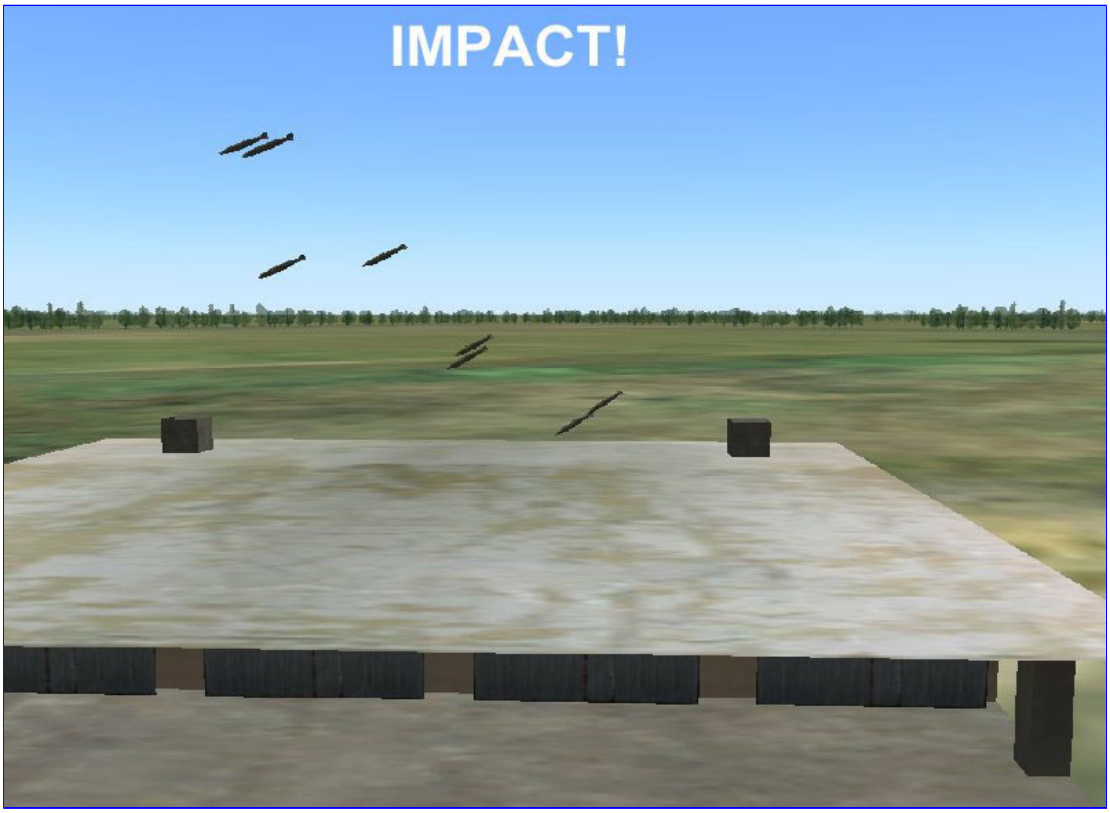
Airspeed control is also important. A changing airspeed is a parameter that the release computer must contend with. The less the airspeed changes, the better the release calculation becomes. Airspeed determines your altitude lost in the pullout... too much and you pull out lower than desired. Finally, changes in airspeed affect trim. Most pilots do not trim in the dive, and the result is that increases in speed may cause a slight nose rise that takes your TVV away from your AOP. Avoid this by throttling back once the dive is established to about a mid-range power setting (low to medium dive angles) and idle for medium to steep dive angles.

Reaching The Pickle Point

We've throttled back, held a constant AOP, and killed any drift... all we have to now is wait for the CCIP to reach the target. Yup, folks... it's about as easy as that. Hold that AOP constant, control your speed, and keep the PBIL running through the target is the hard part of the final. Pickling is the easy part!

But a note of caution. Don't get too eager! Wait for the CCIP to move up to the target. Many a pilot has accelerated this by inadvertently increasing his backpressure on the flight stick. Not good! This imparts another parameter for the release computer to deal with... at a time when you want everything to be as smooth as glass.

So the trick is to concentrate on keeping the AOP constant... and watch the CCIP out of the corner of your eye. Note its rate of movement towards the target... this will give you an idea of how much time is left before the CCIP reaches the target. Hold your nose on your AOP and let the CCIP run up to the target. As the CCIP nears the target, keep the stick pressure constant. Don't try to pull the CCIP up to the target and don't try to hold it there either. Anticipate its movement through the target so that you pickle on the target and not past it. Here is the result.



In my last article, I mentioned the “track-shoot-track” technique when strafing. The same is true in bombing. The idea is to pickle as the CCIP moves through the target while holding that pitch attitude. Don’t “snatch” the stick back at release... instead, ”follow through” for a half second or so to ensure a smooth release. Those of you who like to shoot skeet and trap will know what I mean.

Moving Targets

The last thing I want to mention is a way to deal with moving targets. While the CCIP may seem to be “magic”

sometimes, it still doesn't know that there is a target down there! It's telling you that if you pickle now, the bomb will land at a certain spot. Whether there is a target there or not is your problem... not the computer's!!

In the game, we can go after moving convoys... and depending on what type of vehicle is in the convoy, the convoy can move along fast enough to make aiming a problem. There are three factors that we have to consider... the speed of the convoy, the attack axis, and the time of fall of the weapon.

Convoy Speed

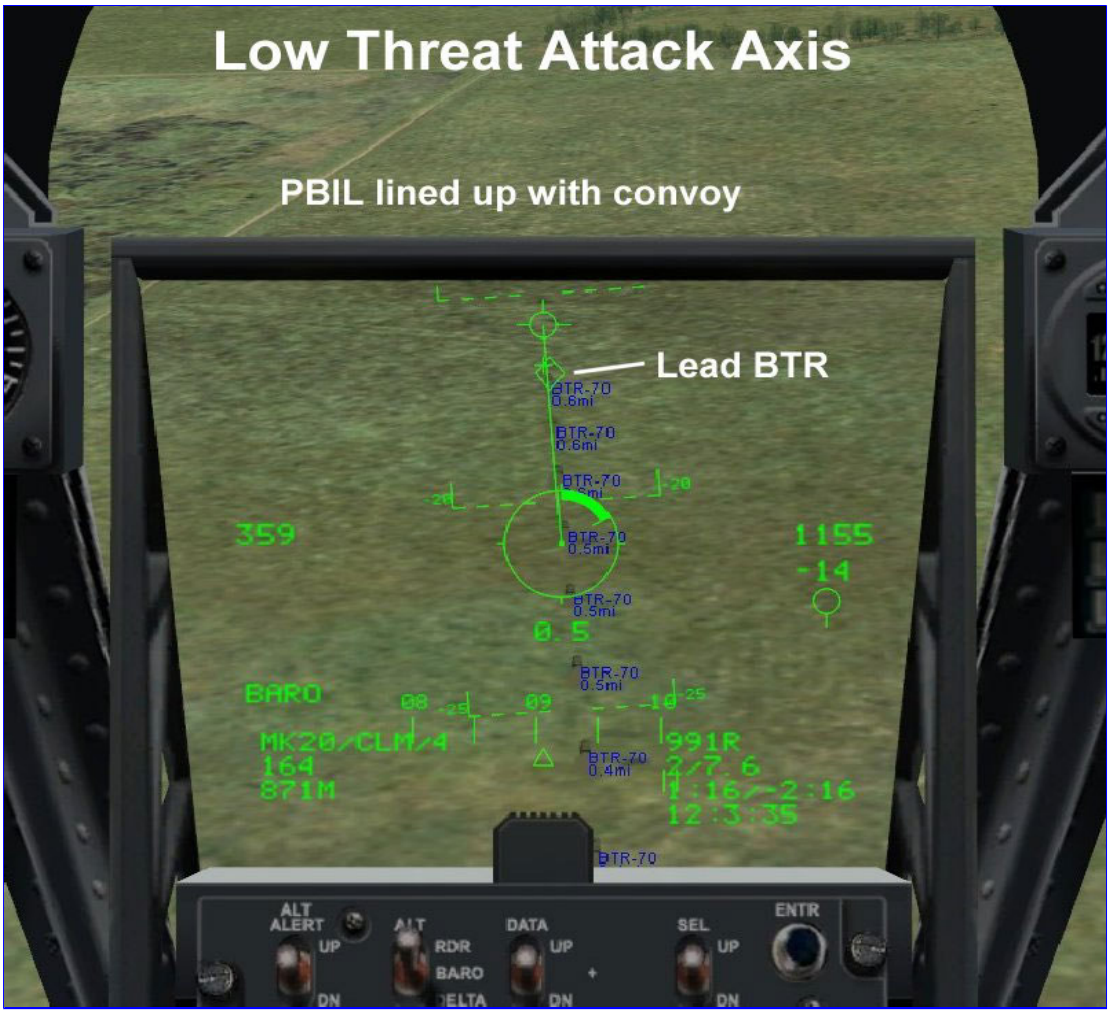
Vehicles like BMPs roll along at a good clip. Trucks are less speedy, and tanks may be the slowest. Try to know what your target type is ahead of time. This way you will be prepared to adjust your aim if and when the time comes.

Attack Axis

Your attack axis is the angle that your flight path crosses the convoy. For moving convoys, a 90-degree axis results in the greatest sense of apparent target lateral movement (speed). If you are perfectly aligned with the convoy, you have a zero degree axis... but if the convoy is coming at you, its forward speed may present aiming problems. Finally, weapon type is an important consideration. CBUs are a better area weapon than a low drag bomb... for this reason, I suggest you ripple bombs when attacking convoy targets that are moving.

I suggest two techniques.

If the threat level is reduced, you may want consider aligning your attack axis with the convoy... this works well with CBU weapons due to their wider "footprint" (more leeway in lateral miss errors). Attack from the rear if possible.



In a high threat environment when your aiming time is short, plan an attack axis that crosses the convoy at an angle of 30 to 45 degrees. Try to attack from the rear to minimize the effect of convoy forward speed.

Release Altitude

Your altitude at release affects the bomb's time of fall (TOF). During that time of fall, the convoy is moving... longer TOFs can cause greater miss distances. For that reason, I suggest an adjustment to the initial sight picture that places the CCIP a little further down from the target. Instead of the 50-50 ratio (AOP-target-CCIP), use maybe a 33-67 ratio. This results in a slightly lower release altitude... and therefore shorter TOF. But don't overdue it... remember the words about getting too low!

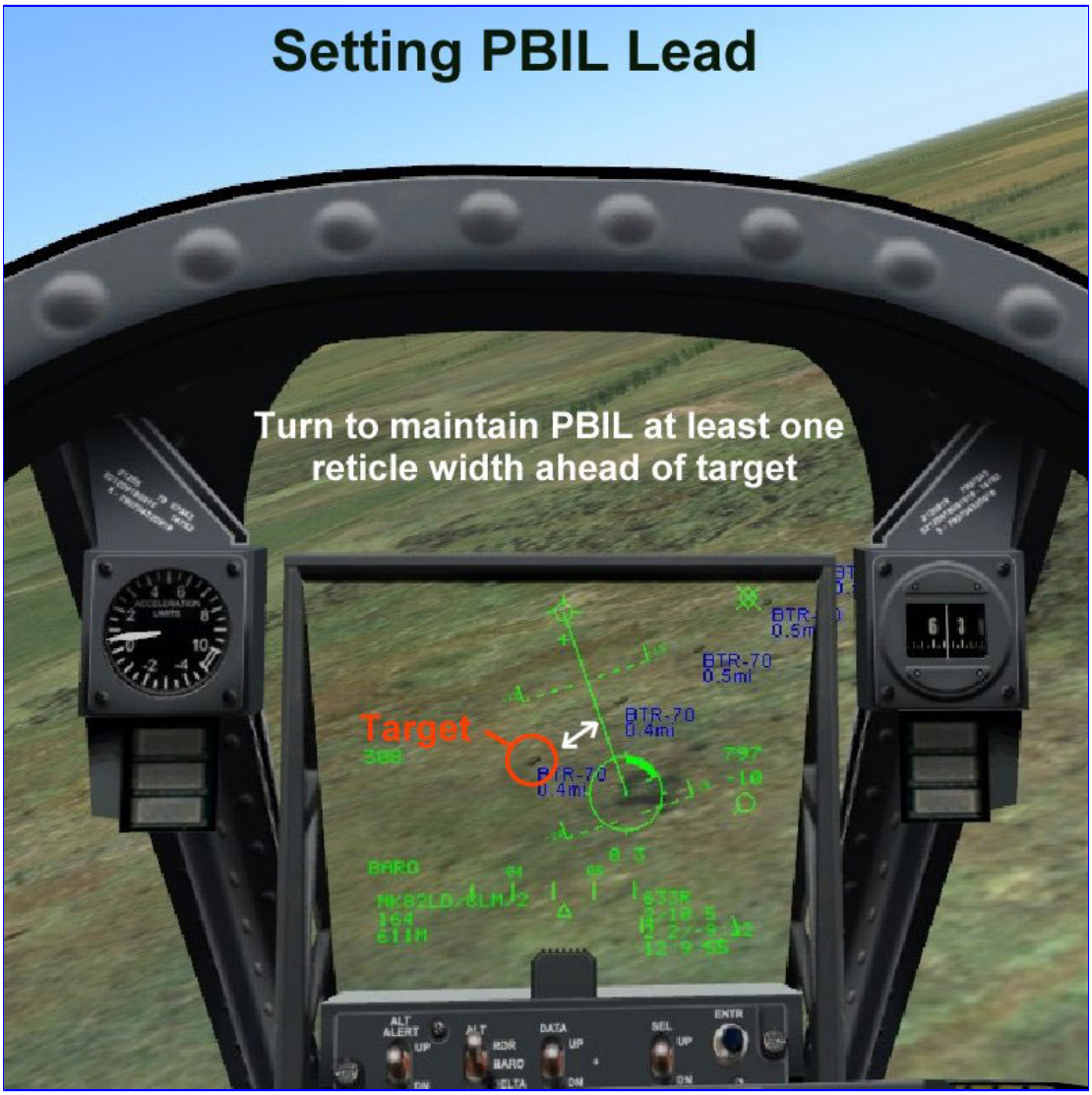
Curvilinear Attack Flight Path

A curvilinear flight path is one flown in a bank... a descending, turning flight path where the pipper and target come together only at the end. This technique can be useful if you find yourself faced with a large attack axis angle against a moving target. The idea of the technique is to aim in front initially and then slow target apparent movement down by turning in the direction of target movement.

Remember, as long as you can see the CCIP and the PBIL is solid (not dashed), you have a valid release solution.

Initially roll out with the top of your HUD aimed well in front of the target's direction of travel... you roll out with your nose "in lead". Establish the AOP-target-CCIP ratio using the target's projected direction of movement as the middle point in the ratio.

Once you have set the aiming ratio, maintain your attitude and let the target move towards the PBIL. Look at the CCIP reticle. Note the distance from the pipper in the middle to the reticle itself. That is the distance that you want to lead the target with.



As the target approaches the PBIL, roll into a shallow turn in the direction of target movement. Vary your bank angle to hold the target away from the PBIL by the ½ reticle diameter that just described. If necessary, increase your bank to keep the target from closing on the PBIL.

Maintain your banked attitude and your ½ reticle lead point... let the CCIP move up the PBIL until it reaches a point right in front of the target's projected movement. Now, pickle! This technique is only a starting point for attacking moving targets. The curvilinear approach works well but lead points vary with attack axis, target speed, and weapon type. Use this technique to build yourself an "eye" for the proper lead point.

PICKLE!!


The first two Mk 82s hit the ground just behind
the BTR...the second two hit the vehicle

Summary

OK... let's hit the high points and then call it a day.

- A good attack starts with good parameters. Use our parameters to fly a realistic bombing pattern.
- Understand the LASTE HUD symbology for A2G bombing.
- Understand the concept of the AOP and its relationship to s typical A2G flight path.
- Know how to set your desired dive angle.
- Know how to "track" the target.
- Understand the effect of trim and speed on the release point.
- Know the importance of "follow through".
- Know how to deal with moving targets.

Once again, that's it... a "quick and dirty" on how to get the most out of your jet!

Test System Specs

This is the computer that I used in this article.

- Pentium 4, 2.0 GHz processor
- ASUS P4V4X / 533 FSB motherboard
- On-board sound
- 1GB RAM
- Windows 2000
- VisionTek ATi Radeon 9800 256MB (1024x768, 32-bit color)
- Catalyst 3.10 drivers
- Direct X 9.0b
- HOTAS: TM F-22Pro (digital), TM TQS throttle, and TM Elite rudder pedals
- LOMAC Gold version

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