

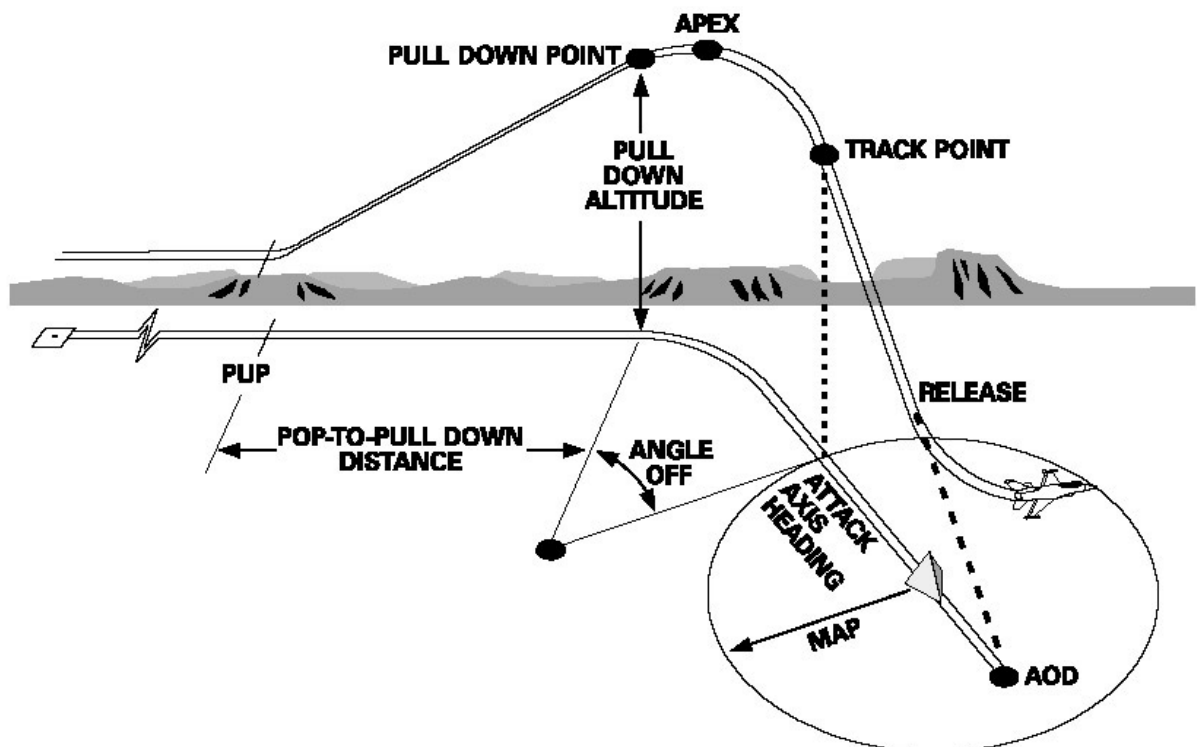
# Weapon Delivery Planner

## Manual

Version 1.3 for Falcon AF

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Picture from MCH F-16 Volume



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## Introduction.

Imagine you have to bomb a bridge and AAA and SAMs are defending it. The weapons assigned for the job are MK84s and you are coming in at 20,000 feet. You see your target at your 2 o'clock, 5nm. The RWR is screaming with AAA and a SAM 2 just got a lock on you! You turn to the target, but with everything going on, you lost it. Ah!... there it is again! Turning the nose on the target, diving to the ground. Aiming, aiming, yes you got it. Pickle and get out of here. But what was that? Altitude is 7000? BANG, BANG, BANG..... I just got hit! Engine is out and it's time to leave this piece of falling metal.

It has happened to us all. Getting shot down by SAMs or AAA while dropping your bombs. How do you get to the target and even more important, how you get back alive? This is the big question for all strike missions. Planning is partly the answer. If you plan your attack, you will have a better chance to survive the strike mission. But how and what can you do? One of the things that could be done is making sure you are not seen. Ok let's take a F117 or B2 and we will be ok. But we are Viper drivers aren't we? We don't have that choice.

One thing you might try is staying below the radar and pop up just before we drop our bombs. This will give the enemy only a short time to track and thus a short time to aim and shoot at you. You could also stay above the threat and drop your bombs from a safe altitude. Maybe we could stay far away from the threats and toss the bomb to the target. But when do we go up? How high do we climb?

The answer to these questions are found in the MCH 11-F16 Vol. 5 and RP5 manual. This program will give you the variables to put in the F-16's computer. Basically they are *extra waypoints* at the last part of the attack. The F-16 will display these as *visual cues* in your HUD and these are the points where you will make turns, pulls and dives. In this way you can fly a planned attack with unguided bombs. These tactics can be used against all static targets like buildings; bridges and static vehicles with known positions.

This manual will not only explain how to use this program, but it will also give the explanation how to use this data in the cockpit. And so it will also describe some tactics that can be used to get you home safe.

### More versions of WDP1.3?

Why is this version called: WDP 1.3 for AF. Does that mean that there are other versions? Yes. The main version is made for Open Falcon. The avionics in OF have been improved so much that there is a need for different versions. If you don't have the WDP1.3 OF version, you can still use the data that this version generates.

### Differences between Manuals.

Some manuals use different names for the visual cues and differ in the positions where they are placed. Some things in this manual will differ from what you might be used to. Because Falcon is a computer program and not a real F-16, it has its limitations. Even though Falcon AF looks very real, if you compare the avionics to the MLU\_M1 document you will find that a lot is missing or is not the same as in the real jet. We need to change some small parts to get better use of what we find in real manuals. Feel free to use all the calculations as you want, just have a careful look at the names and places I gave to the points to avoid confusion. Take some time to look at the pictures and take a note where the cues are placed.

In version 1.3 the placements of the points have been changed to be more same as in the MLU\_M1 document. The difference between VIP and VRP is now used as it should.

## Important rules.

To fly the pop-up correctly, you should fly the planned trajectory as precisely as you can. You will have to be especially focussed on several characteristics. The other profiles can be flown a bit less precise.

### Climb and Dive path.

The reason for calculating all these points comes down to one simple thing. It will get you to an exact point in the air where you aim the plane at the target. You will then have the right dive angle, speed and height.

For the pop-up imagine driving a car over a high round bridge. On the other side of the bridge is the target. From the highest point of the bridge to the point where you exit the bridge is a straight line. This is the same as the bombing run. It doesn't matter how you get to the highest point of the bridge, you just have to get down on that straight path. What does that mean for us? It means that all the climb- and dive angles are straight paths through the air from one point to another. To fly a climbing or descending path, you should fly with the help of the FPM (Flight Path Marker). If you want to fly a dive angle of 30deg, the FPM in the HUD should be on the 30deg ladder. It does not matter where the nose of the plane is pointing.

### Speed.

One other important value to think about is the speed you fly. It is important to fly the speeds you have planned, since all the ranges and performances are calculated with this speed.

All the calculations are done in True Airspeed (TAS). The TAS is the speed with which you are actually moving through the air. It is possible to use Calibrated Air Speed (CAS), but then the CAS has to be corrected for the TAS. This means that when you climb, the CAS will become less while

the TAS stay's the same. So if you climb to a higher altitude, its ok if your CAS drops a bit. I prefer not to switch my basic instruments too much and fly the profile with CAS.

#### ***The difference between Height and Altitude and Elevation.***

*A mountain has an elevation of 2000'. That means it is 2000' higher than MSL. (Main Sea Level)*

*If you fly at 3000', you will fly with only 1000' between you and the mountain. Your height is 1000'. This is also what your Radar Altimeter (RA) indicates*

*By default in Falcon your altimeter is set to AUTO. This means that If you fly below 2000' height, your altimeter will be indicate your height (RA) If you fly higher it will indicate Barometric Altitude set to MSL. You can switch your altimeter to Auto, RA or Baro on the right console.*

#### **The difference between TAS and CAS**

*In the cockpit there is an instrument that measures pressure. This instrument has an error. An airplane speed indicator indicates IAS (Indicated Airspeed). Calculate the error of the indicator itself, and compare it with the IAS. If you delete the error of the indicator you will get the CAS (Calibrated Airspeed). Error of the instruments is so small that you can say that IAS is the same as CAS. But you still don't have the TAS. The first problem is altitude. The higher you get, the less molecules there are in a fixed amount of air. That means you need more speed to get the same pressure in the instrument. The result is: If you climb with a fixed CAS, the TAS will increase.*

*The other factor is temperature. Higher temperature means less molecules in the same space and so the same effect. I believe in Falcon4 the atmosphere is modelled as the standard atmosphere. The result is that we can neglect the temperature effect.*

*The F-16 can show you TAS in the HUD. Look at your Airspeed tape on the left hand side of the HUD. You can see a symbol like this "C". The C stands for CAS. Use the switch on the right lower console or the key SHF+CTRL+ALT+V to change it to "T". The airspeed you see now is the TAS. ("G" is Ground Speed). Just taping the key when you are on the ground won't change the indication in the HUD, but the TAS is pre-selected. It will change automatically when you raise the gear. The instrument will always show CAS when the gear is down.*

### Heights and Altitudes.

Height and altitude can also pose problems. When you want to drop your bombs at 8000' height, but the target is on a hill that's 2000' high, you will have to drop your bomb at 10.000' altitude. Remember: height is the space between you and the ground. Altitude is the amount of feet between the airplane and MSL. (Main Sea Level) Elevation is the difference between MSL and the ground.

# Planning your mission.

## What do we need?

This is always a good question to start with. When you know what you need, you also know what you should be looking for.

For a start we need to know what the target is. Is it a “point” like a radar dish, or is it a long target like a bridge or building? If it’s a “point” it doesn’t matter from which direction you attack it. If it’s a long bridge you might want to think about attacking it along its axes. This way you can ripple your bombs in a “stick”. What is the elevation of the target? Is it on a mountain or at sea level?

What is the threat that surrounds the target? Can you find a route around AAA and SAMs?

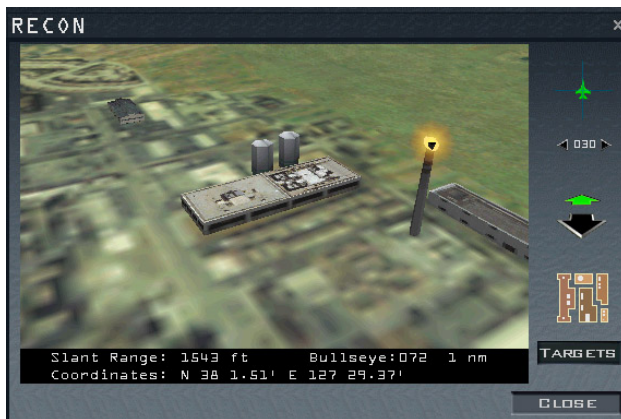
What does the surrounding look like? There could be a mountain blocking your route during the attack or during the exit. Do we ingress at a low or a high altitude?

As you can see, there is a lot to think about. Here are 6 steps to follow.

### **What do you need**

- Type of target
- Target coordinates
- Target heading
- Elevation of the target
- Threats
- Surroundings
- Weather

## Step 1. Recon.



A good place to start is the recon screen. Take a look at your target. When it’s an elongated target, note the heading to which it is aligned. Falcon AF has the option to see the coordinates of the target. Write it down, you can insert it in the DED and the target waypoint will be over the target. In the picture you can see Kaesong textile mill. We will use this as our training target later on. See how long the target is. Then you can decide on ripple and spacing. Notice the colour of the target. This might help during the day. A dark building can be found nicely when it has a

light background.

Try to find out what the elevation of the target is. What is the weather like? Can you see the target when you are at 3.000 feet? This will give you the first idea for the ingress altitude. Also take a look at what is around the target. This is for a mental picture so you can recognise the target quickly. For example look at roads, mountains and buildings. The factory, our target for this mission, is just at the edge of town. Maybe make a small sketch of the surrounding and the big objects. If you use the print function you have some space for writing down the coordinates and a sketch of the target at the bottom of the printout.

Look at the positions of AAA, SAM and radar stations. You should get a plan working in your head now. If you can’t think of any route to the target, stay home! (Start with SEAD strikes first.) Check if objects like mountains or cities block your entry and exit. You should look in a radius of about 10nm to 12nm. You can change the distance for the starting point a little bit. Maybe you can avoid some mountains. The calculation starts from a point that is at the same elevation as the target. If you start higher than the target, you will end up at the wrong place when you turn in to the target.

### **Trick for finding the length of an Object**

To find the length of an object, in the recon screen look at the target from straight above by clicking the brown button (above the Target button). Turn the object so it is pointing from left to right. Now use the Zoom function to close in to the object. Zoom it until the sides of the object are at the side of the recon window. At the bottom you can find the Slant Range. When the object is touching the side of the recon screen, the object length is almost the same as the Slant Range.

## Step 2. Type of delivery.

With the Weapon Delivery Planner you can use three different types of tactics for an attack.

- A Pop-up attack,
- High Altitude Dive Bombing
- TOSS delivery attack.

As a famous Dutch soccer player / coach once said: “Every advantage has its disadvantage”. The same thing applies to every type of attack.

Using a Pop-Up you can stay below the radar of most of the SAMs. Although you should fly fast, but beware: you are in range of MANPADs and AAA.

A HADB will put you above most of the MANPADs and small SAMs but you will be a nice target for high altitude SAMs like the SA-5.

The TOSS delivery will keep you low and at a distance of the target. But the accuracy of hitting the target is smaller.

Which one do you select for the correct situation? This question together with step 1 will be the biggest decision you have to take.

## High or Low level ingress.

First make a decision between a high or a low level ingress. The choice of a high or low ingress is actually only about the last part of the ingress. Picture a circle of about 30nm. Everything that is outside of 30nm range of the target is en route and can be flown at a fuel economic altitude. Plan your routing around SAMs and other threats when you are ingress to the target.

Getting into the 30nm range of the target you might get into the range of SAMs or fighters that can not be avoided.

At this stage there are two options: The first option is usually a good choice in the beginning of the campaign: Low level ingress. The target area is protected by medium or high altitude SAMs and the chance of enemy fighters is still high. This way you can avoid detection of the enemy radar and try to stay Air-to-Air until the last possible moment.

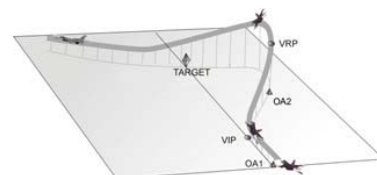
The second option you will most likely encounter later in the campaign. Most of the SAM radars have been disabled and only MANPADs and AAA are a threat. Now we can make a nice “safe” high level ingress. Deal with enemy fighters at long range and stay above the ground threats.

## Low level ingress.

With low level ingress we again have two options. Here we can use a Pop-up or a TOSS delivery. Choosing the Pop-Up or TOSS depends on the target to hit and if you can fly over the target.

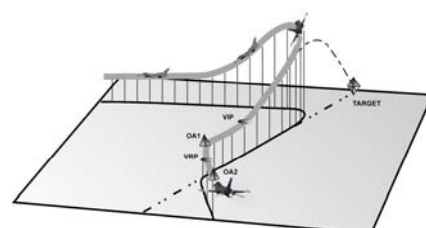
### Pop-Up.

This type of delivery can be useful for all static targets. Think about buildings, bridges, runways and even vehicles. The ordnance that can be used is the whole range from low and high drag dumb bombs, cluster and laser guided bombs.



### TOSS.

For a low level ingress we should also use a LAT delivery. LAT stands for Low Altitude TOSS. During this delivery the bomb will be released upwards. The range will become greater but the accuracy smaller. Therefore the best type of bomb used will be a cluster bomb. This is a very nice way to attack a group of





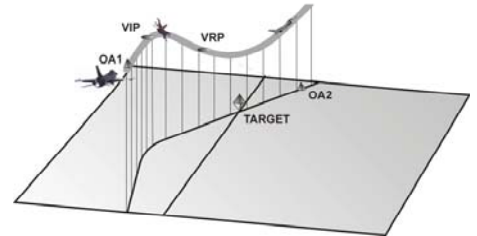
vehicles like a SA-2 or SA-3 site. But also freefall bombs can be used against large targets.

### **High level ingress.**

So now the area is clear of high altitude threats or you have a SEAD escort to take care of them. Then it is time to stay high above all the other small threats. Most of the MANPADs can't shoot above 12,000' and the bomb release should be planned above this altitude.

### **HADB.**

This delivery should keep you above a planned altitude and can be used for hitting all types of static target like buildings, bridges and vehicles. Any type of bomb can be used. It is also possible to use missiles like the AGM-65 with this delivery.



### **Step 3. Ordnance.**

If you can, choose your ordnance carefully and wise. Think about the target to hit. Most important question: will the weapon destroy the target?

Do I use low or high drag bombs? Maybe you want to use a laser guided bombs. This will all depend on the delivery, weather and the target.

Also the amount of bombs is a factor. You must take in account the weight of the aircraft. Using 2x MK84's and 2x drop tanks with a pop-up and a climb to 12,000' will not work. You will lose too much speed. Taking 2x MK84's and 2x drop tank with an ingress height of 20,000' and a HADB delivery will work.

The weather can be a factor. If you know that the target is covered by a cloud layer, the laser for a guided weapon will not work through the cloud layer. In this case you have to revert to dumb bombs.

See what the "stick" length will be with a ripple bombing. You should always drop all the bombs on the first pass and leave the area. You should never want to make a second pass over the target unless you are really, really, really sure that nothing can shoot you down! (And even then don't do it!!!)

If you encounter any problem making a plan during Step 1, 2 or 3 revert back a step and try another option.

### **Step 4. Dive angle and Release height.**

What will be the best dive angle and the release height? High dive angles give a better accuracy, small dive angles gives you more cover from the ground. Also think about the bomb blast by determining the dive angle and release height. When you fly at very low altitudes you might end up getting damaged by your own bomb blast.

Look at the surrounding. Maybe a mountain will cover your pop-up or a TOSS delivery.

Higher release altitudes are easier to fly, you have more time and space to correct errors. Dive angles of 30 degrees will give you a nice compromise to start with.

If you use high drag bombs, you will probably fly over the target but won't have a problem with the bomb blast. When using high drag bombs from a higher altitude, the target is most likely not visible in the HUD and you have to use the CCRP mode of the FCC.

Make sure you know how to use the weapon. Weapons are designed to be used in a certain way.

Bombs like the Durandal have been designed to be dropped at a height of 250' and be used against runways or taxiways. A near level flight with high speed over the runway is used.

### **Step 5. Attack heading and approach.**

At which heading do you want to drop your bombs? Does it have to be a specific heading like bombing a long bridge? Take a look at the upper right corner of the recon screen. You can find the heading there.

One other thing has to be taken into account. You have to take a look at where the first point for the profile is positioned compared to the IP in Falcon.

Mostly the first point is at around 10nm from the target. If you can, adjust the place of the IP so it has a good use. I will explain this later.

### **Step 6. Leaving the target area.**

To which direction do you have to turn to leave the area safely and how far do you want to fly in that direction? This all depends on the threat around the target and the position of the waypoint after the target. Find the safest route and note the bearing and distance from the target.

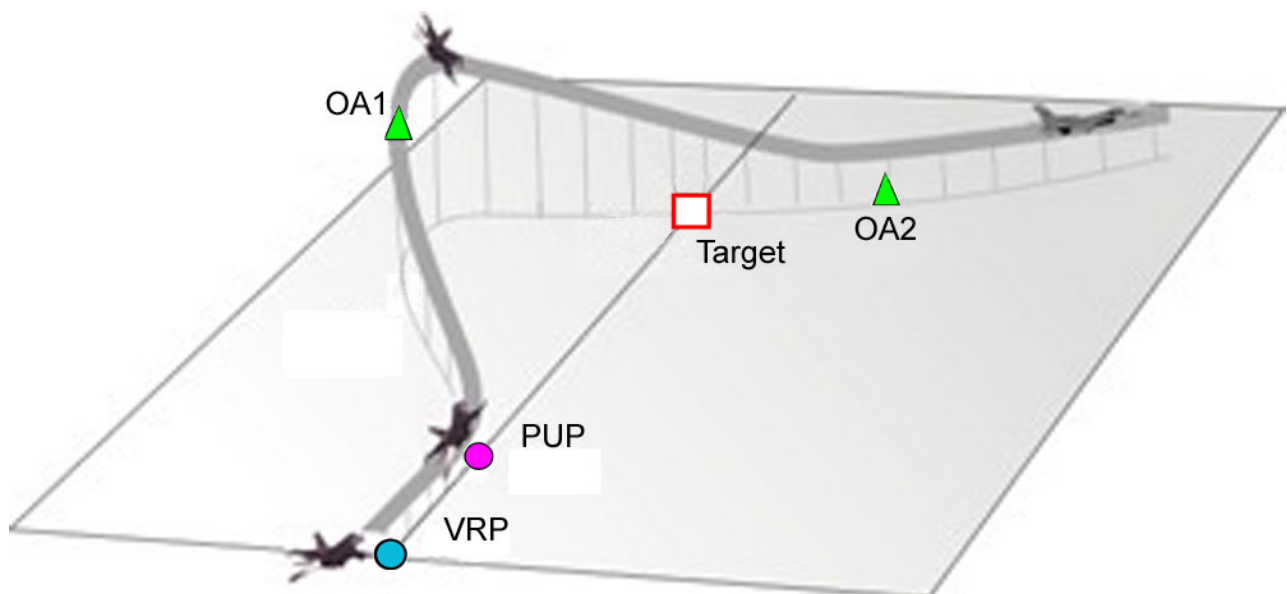
One more overall idea about the strike mission: Don't think you can handle everything. The A-A missiles you will take with you are for self defence. You might plan to avoid being detected by radar and hit the target and go home. The hardest part is still the enemy that will defend the target with fighters. Fighters will shoot at you while you concentrate on the ground target. Make sure you've got a good team that will do a fighter sweep at the time you hit your target.

# POP-UP.

## Pop-up theory.

I will start to explain the basics of a pop-up. The objective of this chapter is just to get known to the procedure and what it should look like. When this objective has been met, you will find more details about how to fly it in the chapter: Flying the Profile.

You have to fly a route that I call 'the profile'. In the program you can select two types of profiles, Type 1 and Type 2. When it is flown correctly, you get your target under the pipper at the altitude and dive angle you planned to drop your bombs. It sounds easy but you will have to do a lot of turns and pulls in a very short time. At the same time you have to know where the target is. This all happens at a very low altitude and with high speed. The result of this is that the AAA and SAMs have a hard time hitting you.



There is the possibility to program visual cues in the computer of the F-16. Beside waypoints there are 4 types of cues. These are called VIP, VRP, PUP and OA's.

VIP = Visual Initial Point

VRP = Visual Reference Point

PUP = Pull Up Point

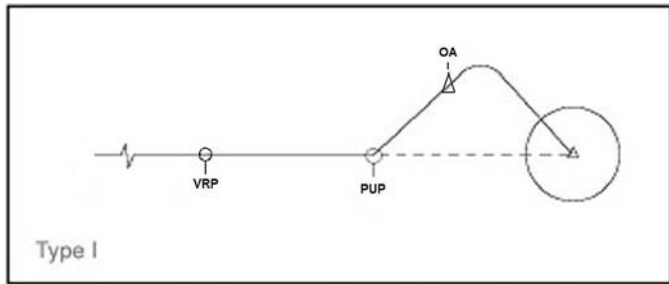
OA = Offset Aim

The VIP, VRP and PUP are displayed in the HUD as *circles*. The OA's are displayed as *triangles*. The Weapon Delivery Planner will provide you with the data that should be entered into the F-16's computer to have the visual cues at the right position.

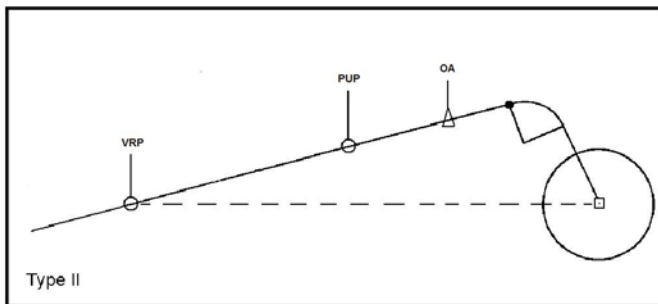
You can fly a lot of different kinds of pop-ups. In this program there are only two of those profiles. With the combination of all the different release heights and dive angles, there should be ample options. For these pop-ups you will fly a flight profile that will basically be the same. So when you got the idea how it works, it doesn't change if you select other values.

**Type 1 and Type 2.**

As you can see in the picture to the right, the first option is to fly directly towards the target. Before you get to the target you turn away from it and start your pull-up. At the highest point you turn back to the target. This is called TYPE 1. The second option is to fly a track that is at an offset of the target from the beginning and start your pull-up at the right point (TYPE 2).



This can be seen in the picture below. In both cases you will get a certain offset from the target, which will give you the correct distance for the final turn and your bombing run. This distance will also give you a chance to find the target by looking to the side. This can be done before turning towards the target and makes it a lot easier.



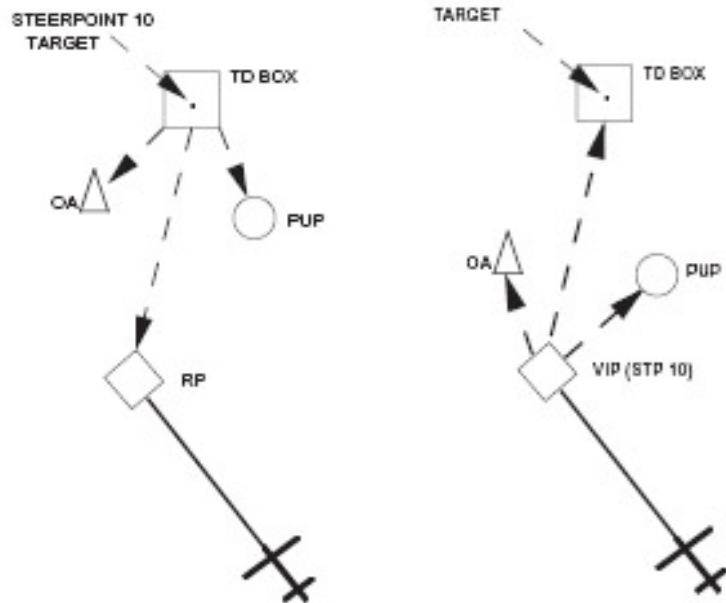
Type 2 is a bit easier to fly, because you won't have to do the turn before the pull-up. How the two profiles are flown, is explained in: Flying the Profile.

**Reference point.**

To get yourself in the correct place and doing the turns, you can place 4 points that can be seen in the HUD. These points are placed by bearing/distance from a reference point.

In older versions of WDP, the reference point was always the target. Now we can choose where the reference point will be. For this we have to separate the setup into two groups. The reference point is the target or it is not the target. When the reference point is the target, we use VRP. The VRP usage is the same like older versions of WDP.

When the reference point is **not** the target, we use VIP. With VIP usage you place your reference point at a smart place that is **not** the target.



In the left schematic you can see that the reference point is the target and the waypoint is also placed over the target. This is done when you use the VRP setup.

If you look at the right schematic, you can see that the reference point is not the target, but somewhere else. Also the used waypoint, the IP, is placed at this point. The IP is set at a place

where it is good to use and that will be the reference point. It has now become the Visual Initial Point (VIP). So as an example, place the VIP over a building that you can find easily and fly to it.

### **What is incorrect in Falcon AF.**

Sadly there are some things not correct in Falcon AF and I do have to point them out. This because the way some things work in the real F-16 and I like to get as close as possible.

One of the things that are incorrect is how the points are inserted and used. You should choose for VIP or VRP and select it accordingly. There should also be the option to insert the PUP. This is the Pull Up Point and is connected to the VIP or the VRP accordingly.

As an example for a VRP usage you will have the following points: The VRP, the PUP and the 2 OA's.

For the VIP usage you should have: The VIP, the PUP and the 2 OA's

Falcon AF doesn't have the PUP, so we have to improvise. For the PUP we will use the point that is not used when we have selected VIP or VRP. So for the VRP usage, the VIP is not used. The VIP is then used as the PUP. This way we will get the closest to real life as possible.

### **The PUP.**

The first point I start to talk about is the point where you start turning and climbing. This point is called the PUP or Pull Up Point and has a known bearing and distance relative to your reference point. The PUP is displayed as a circle in the HUD. Flying towards the PUP should be done with a pre-planned track. For Type 1 this track is planned in such a way that you will fly in a straight line over the PUP to the target. For Type 2 this track is the same with which you will do the pull-up. More details later.

### **Line up with the PUP.**

Lining up for the PUP is done because, for Type 1 you need to make a turn of an exact amount after the PUP. This will be the heading with which you pull-up. For Type 2 this is already the pull-up heading. To get on this heading towards the PUP you could use a point that will get you line up. For this reason we got the VIP or the VRP, depending on which you are using.

### **The offset.**

For Type 1, we turn left or right at the PUP to a predetermined heading. Like all climbs and turns, it has to be done with a predetermined amount of g's. It will give you an offset slightly away from the target. This offset is made to keep the target in sight when you do the pull-up and makes it easier to turn to the target. You don't have to turn the airplane completely upside down. The amount of bank you have to roll is less and this will make the profile easier to fly.

Using Type 2 you don't need to make a turn to get the offset you need. Just flying from VIP/VRP to the PUP will give the right offset already.

To get you to the correct offset you can use the OA's (Offset Aimpoint)

An other reason for using an offset is the fact that you are harder to hit by AAA. You are not coming head on, but moving sideways. That makes you a more difficult target to hit.

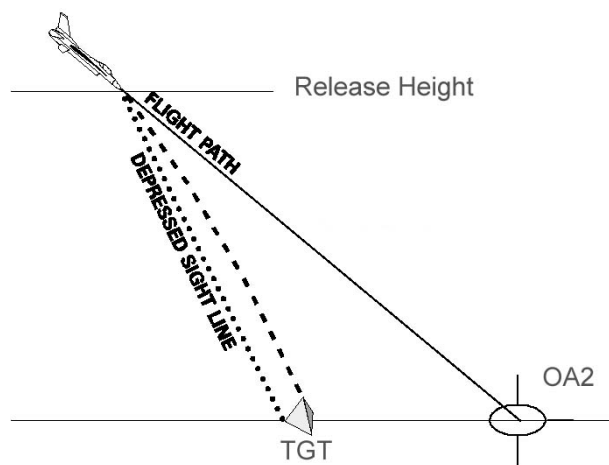
### **The pop-up.**

After passing the PUP, and the turn with Type 1, you have to pull the nose up until a certain climb angle. This is also done with the predetermined amount of gs. Fly along the climb path to a certain height above the target. You are now at the pull-down point. This pull-down can also be shown with an OA. Roll the aircraft with the lift line (looking straight up) towards the target. Then pull the nose, with the same amount of g's, toward the calculated aim point. This point is called OA2 or Off Aim point 2. The distance between the Target and OA2 is called the Aim Off Distance (AOD).

### The dive.

When you rolled the wings level, you should have the planned dive angle. If you have selected the OA2 as Aim Off point, the point you be flying to, you should see it behind the target. OA's are indicated by a triangle in the HUD. Point the FPM at the same distance behind the target as the OA2. You need to fly over the target and not in to the target. See the picture beside for clarification.

If you have flown the plane as it should, you should have a couple of seconds to aim and pickle the weapon. At this stage it is not important any more if you have the exact dive angle or not. Just concentrate on hitting the target. What is important is the height that you drop the bombs. If this is too low, you will fly in the bomb blast and will have damage.



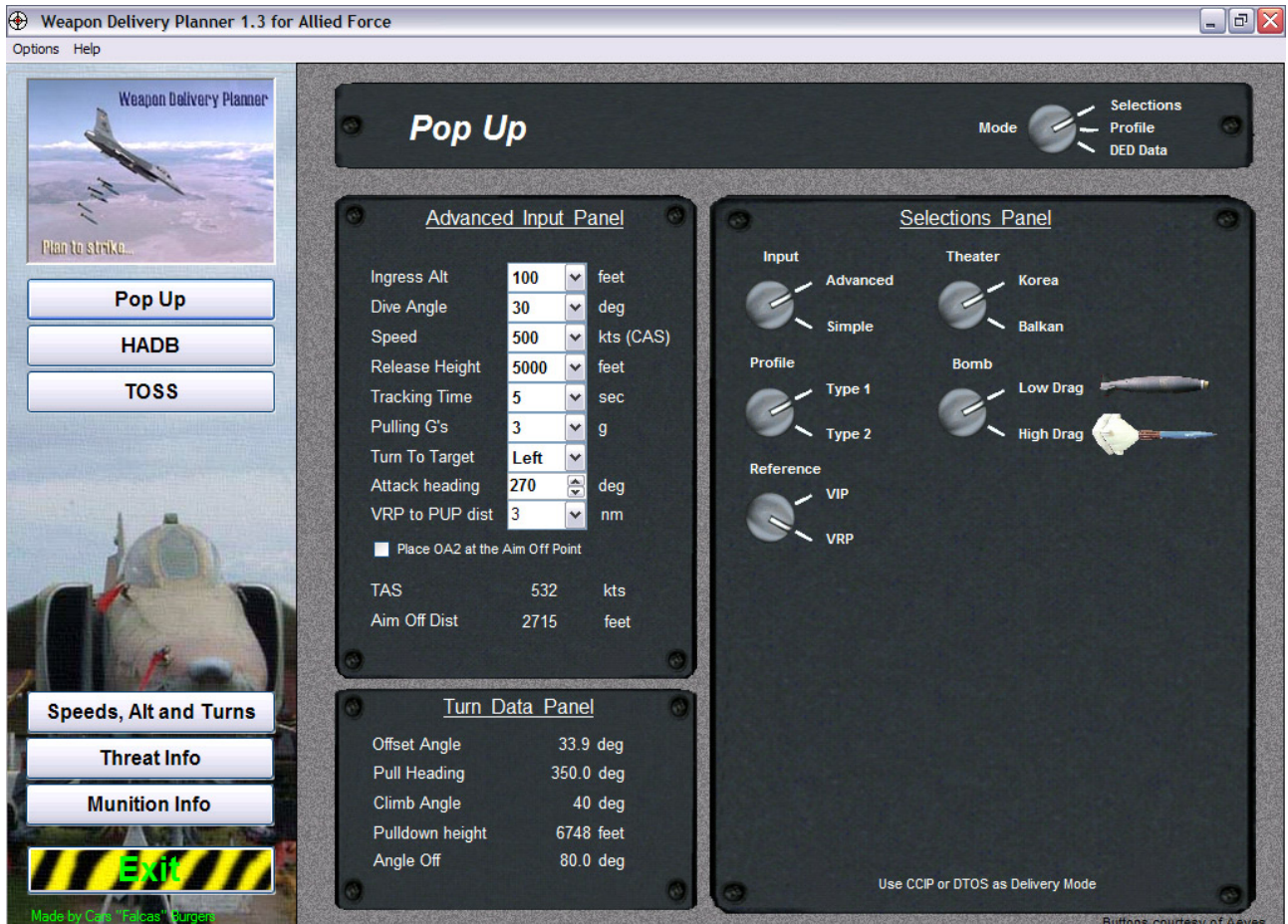
### Leaving the target area.

Now break hard to the predetermined heading or pull up and climb away. The exit point can be shown on the HUD as well. It is called the VRP (Visual Reference Point) and is displayed as a circle.

This will give you a basic idea about what is going on and what points you have to work with. In the following paragraphs I will explain in more detail how to use the program and how to fly the pop-up.

## Putting the accumulated data in the Weapon Delivery Planner.

So now that we did all this research and we theoretically know how the pop-up works, let's get down to business. The picture below shows the Weapon Delivery Planner when the pop-up is selected. It has some panels to select and insert the values you want. Other panels will give you additional information. In the upper panel with the name of the type of delivery you can find the mode selector. With this selector you can set the main information modes for the chosen delivery.



It always starts in the Selections mode. After you have made your selections you can have a look at the delivery by selecting the Profile mode. When you are done you can check the values by selecting the DED Data mode. Except from the mode-switch the position of all the other switches and values are saved. The values will return when you start the program again or when you return from any other part of the program.

### The selections panel.

In the Selections panel you can select the basics for the delivery. With the Input selector you can select the simple or advanced input panel. The simple input panel will give you a fast and easy selection of the options. They are more limited than the advanced panel, but it will give you the basics. The advanced input panels will give you more options and values to choose from.

With the Theater selector you can select in which theater you are flying. This is important for the coordinates of the waypoints.

The profile selector will let you select the type of profile you would like to use. I don't think the Low/High Drag bombs switch needs much explanation.

The reference selector gives you the option to select the reference you want to use. This influences the placements of the IP and Target. It also shows the correct profile.

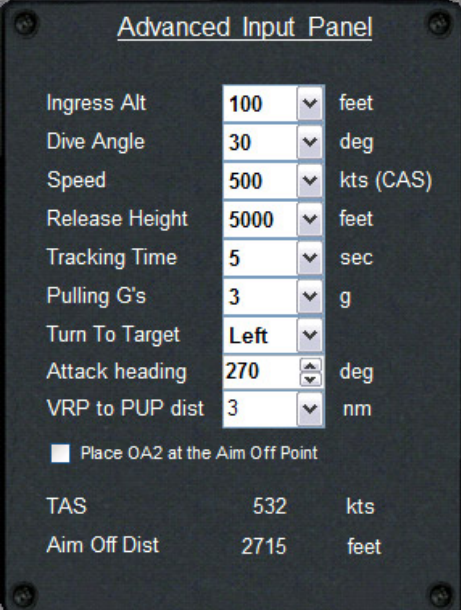
### The simple input panel.

The simple input panel is a quick selection version of the advanced input panel. It has less options to choose from and will work faster. I will only explain the advanced panel. The functions are the same so you should know how to use the simple panel.

### The advanced input panel.

This panel can be used to enter the data we have accumulated before. Just click on a combo box and scroll down the list. Select the value you want.

- The Ingress Alt is the altitude at which you want to approach the target area. It should be low to stay undetected in the case of an popup.
- The Dive Angle is the angle at which you will release the bomb. Select one of the options.
- In the Speed box select the speed with which you want to fly the profile. This speed is CAS. The program will calculate the TAS from this value.
- The Release Height is the height above the target where you want to pickle the bombs.
- The Tracking Time is the time that you have to aim. It starts when you have stopped the turn to the target, but this time starts before you have rolled wings level. It stops when you pickle the bombs. I recommend using 5sec for a start.
- Pulling G's, are the g's with which you want to make all the turns and pull-ups.
- The Turn to Target is the last turn you make to fly towards the target. Do you want to make a left or a right turn?
- The VRP to PUP dist/VIP to PUP dist gives you some control of the distance between the line-up point and the PUP.
- If you select the box "Place OA2 at the Aim Off Point" the place of OA2 is behind the target.

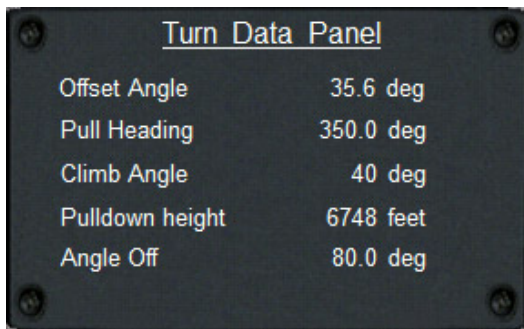


The screenshot shows a dark-themed window titled "Advanced Input Panel". It contains several input fields, each with a label, a value, and a unit. The values are: Ingress Alt (100 feet), Dive Angle (30 deg), Speed (500 kts (CAS)), Release Height (5000 feet), Tracking Time (5 sec), Pulling G's (3 g), Turn To Target (Left), Attack heading (270 deg), and VRP to PUP dist (3 nm). Below these fields is a checkbox labeled "Place OA2 at the Aim Off Point" which is currently unchecked. At the bottom, two calculated values are shown: TAS (532 kts) and Aim Off Dist (2715 feet).

Parameter	Value	Unit
Ingress Alt	100	feet
Dive Angle	30	deg
Speed	500	kts (CAS)
Release Height	5000	feet
Tracking Time	5	sec
Pulling G's	3	g
Turn To Target	Left	
Attack heading	270	deg
VRP to PUP dist	3	nm
<input type="checkbox"/> Place OA2 at the Aim Off Point		
TAS	532	kts
Aim Off Dist	2715	feet



### The Turn Data Panel.



In the Turn Data Panel you will find all the information you need about the headings and the angles.

The Offset Angle is the amount of degrees left or right that you have compared to a straight in flight over the target. For the type 1 profile this is the first turn that will be made.

The pull heading is the heading at which you will pull the nose up to the desired climb angle.

The pull down height is the height above the target where you will start the pull towards the target.

The angle off is the amount of degrees that you have to turn to get on the given attack heading to the target.

Also the attack heading is shown in this panel. If you have selected an approach heading you can find your attack heading here.

### The profile panel.

Now we have made all our selections and want to get a better picture of how the profile will look like. With the mode switch select the profile mode, you will see two pictures that will give you a better understanding for what you are about to fly.

### The DED panel.

So what do we do with all this planning? First we have a look at what you can insert in the F-16's computer. With the ICP and DED you can insert the VIP, VRP, OA1 and OA2 bearing, distance and elevation. The program will give the data in the DED Data panel. This panel contains four pages like the DED in Falcon AF.

You can see that there are two columns of data. One for the VIP and one for the VRP values. You can use the data accordingly. The only difference between what you will see in Falcon AF and WDP are the two DED pages for the PUP. They are the VIP-TO-PUP and TGT-TO-PUP pages. In RL they belong to there VIP or VRP page.



So if you want to use VIP setup, you have to insert the data from the VIP-TO-PUP into the VRP page in Falcon AF.

For the use of VRP you need to take the data from the TGT-TO-PUP page and in Falcon AF insert it into the VIP page.

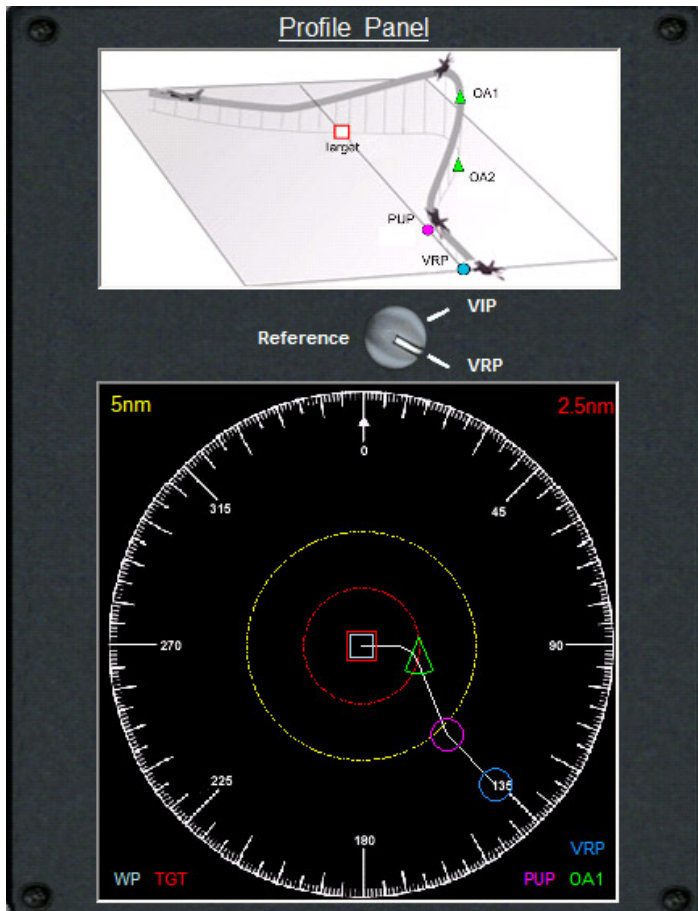
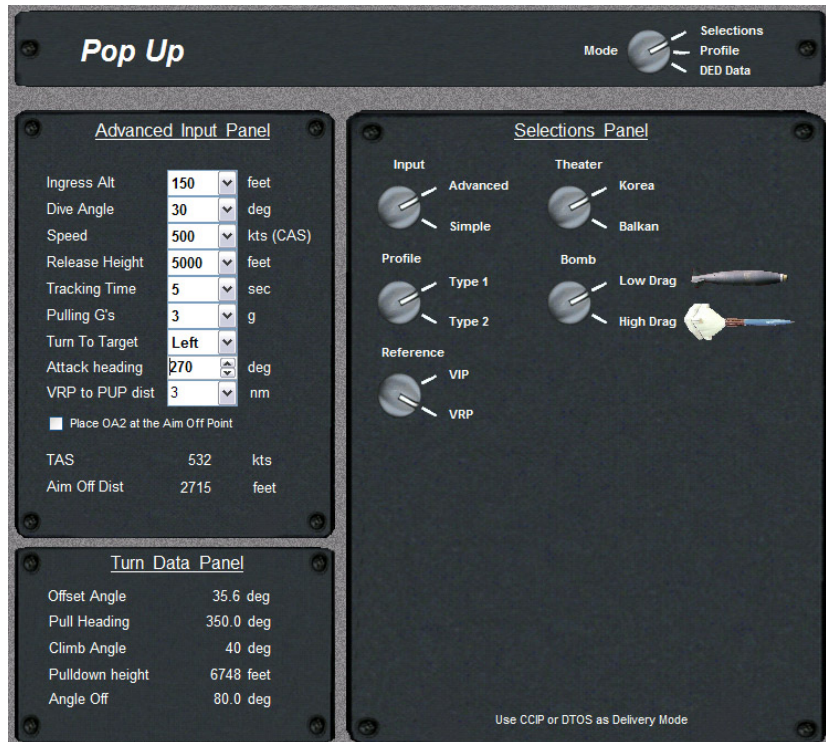
## Flying the profile.

We will use the same values for all the examples. This will make it more clear what the differences are. Set the values in WDP as you see in this picture. They are for a strike on Kaesong Textile Mill. The factory is the target. The waypoint that we will use for the target is waypoint 5. The coordinates are N38 01.51 E127 29.37 so you can insert them so that the waypoint is exactly over the target

## VRP setup.

### Type 1

I will start to explain the use of a Type 1 profile and use VRP as the reference point. As described before the VRP setup is the same as older versions of WDP. So if you are already familiar with older versions this should be easy or you could go to VIP setup now.



The selections for the type of profile and type of bomb should be clear. Also the values in the Advanced Input panel don't need any further explanation.

When all the data is inserted as in the picture above, it is nice to have a look at what we have to fly. So select the Profile Mode.

In the upper part you can see a 3d picture where you can see where the points are placed. Note that you will not find the VIP. The VIP is placed at the point where PUP is placed. If you want to see how it will look like if you select VIP then use the switch.

The lower part will give you a topview of the situation. The different colours should give you a good idea where the points are placed. You can also see how the turns have to be made.

Now you should have an idea of what you have to fly. Changing the values like the attack heading is still possible and you can

see the results immediately. The only thing we need now, are the values to insert into the computer of the F-16 so that the points are shown in the HUD. Switch to the DED mode, it should look like this. Note down the values for the VRP. You can also use the print function. If you use the print function only the data for VRP or VIP, depending on your selection, will be printed. If you print it on an A5 size paper, you will have something like a lineup card with all the data for the attack. Have a look at the print preview.

On this panel you can also see if the target will be visual during weapon release or not. Just look at the line at the bottom.

### Before climbing in to your cockpit.

You still have a couple of choices for the type of delivery you want use to drop your bombs. CCRP, CCIP or DTOS. These profiles are made for visual bombing or radar release. If you set the tracking time to a large value it is also possible to get a lock with the targeting pod and drop a laser guided bomb at low level. Start by using the CCIP mode. Together with DTOS these are the modes that are best suited for a low level pop-up. You can select it before you get close to your target and it works while you have your radar switched off. Switching off your radar is also good for getting to your target without being detected.

With CCRP and DTOS you will need enough tracking time to lock the target while fine-tuning your aim. It can be used but it needs practice.

There are a couple of things you want to do when you have some time and peace. Doing them on the ground before you start to taxi or waiting at the runway is a good time.

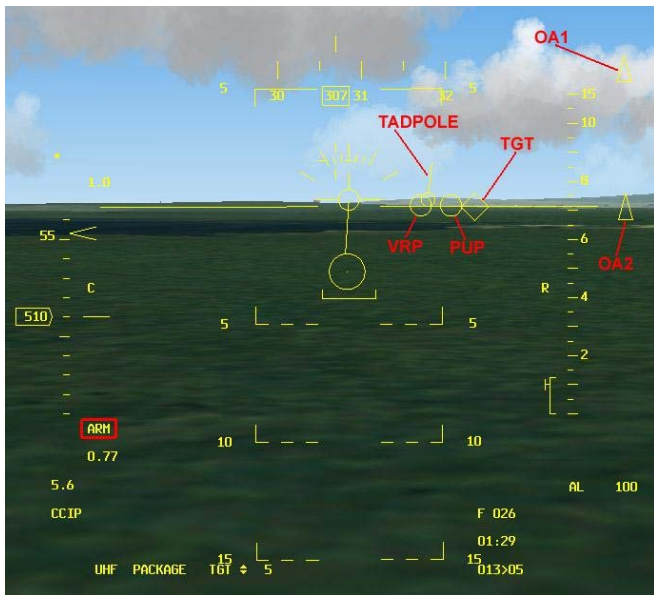
- Make sure you got your Radar Altimeter switched on and working.
- Set your ALOW (Automatic LOW altitude Warning) to about 50' by selecting the 3 button on the ICP and set 50'. (Don't forget to press ENTR)
- Setup you bombs as you planned. Set the ripple, the spacing and the bomb fuse time (Arming Delay).

For information about inserting the data into the F-16 computer and how to setup your bombs, please refer to the chapter: Entering the data in the F-16 computer.

Due to the use of the PUP you have to pay attention to the following. The PUP is not included in FalconAF, so we will use the VIP to set the PUP. Go to the VRP page in the DED. Here insert the data for the "TGT-TO-VRP". Then go to the VIP page and insert the data for "TGT-TO-PUP". The data for the OA's can be done as normal.

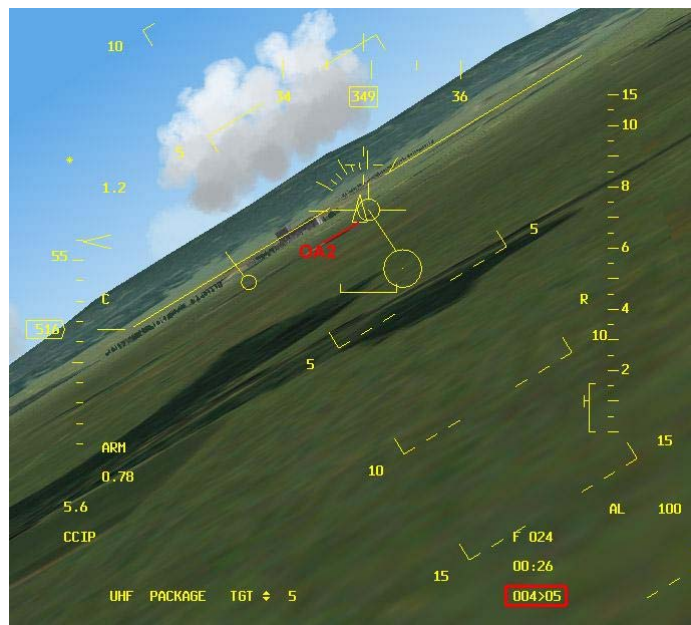


## Approaching the target.

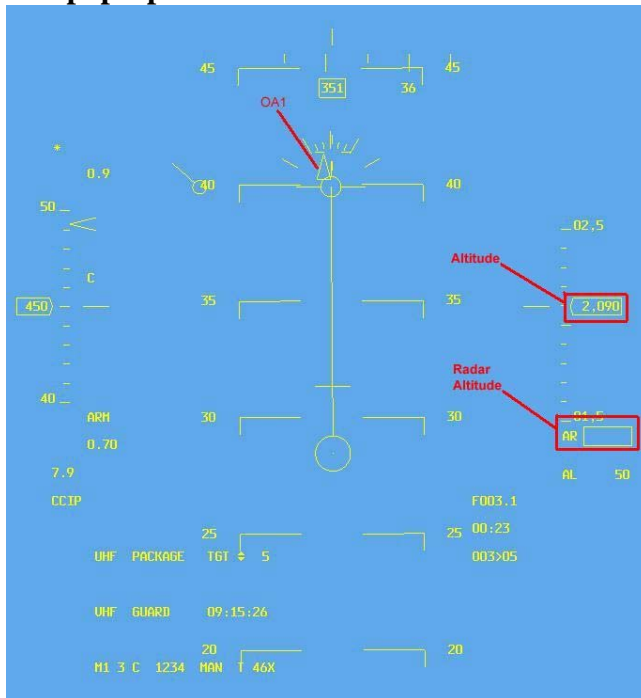


For this strike we will be using MK84's. Passing waypoint 4 you are in a turn to the VRP and flying low. This is a good time to have a look at the left lower HUD corner. It should say ARM, or else you are doing this all for nothing. (Trust me I know what I'm talking about ☺) The VRP is positioned so it is a straight line through the PUP and the target. In the first picture you can see the position just prior passing the VRP. In this case the VRP, PUP and target are almost on one line and you should still fly slightly left of the VRP. The elevation of the VRP and PUP has been set to 100' as the ingress height. If you are lined up for the approach, the VRP, PUP and TGT should be over each other. If the VRP and PUP are to the left of the diamond, as in this case,

you have to fly to the left of the VRP to get them over each other. This is the same principle as landing an airplane on a runway. The VRP is the threshold (beginning of runway) and the target diamond is the end of the runway. Don't overdo this. The VRP is placed so that you are coming from the right direction already. In the picture the circle is almost over the target. You could just fly directly over VRP and then to the PUP. Concentrating on not flying into the ground should be a high priority. Passing the VRP, just continue towards the TGT and keep the PUP aligned with the TGT. Just before passing the PUP you have to make a turn. In this example, the first turn should be made to the right. Just before passing the PUP you have to make a 34 deg turn to the right to a track of 350 deg. The roll should be done before you pass the PUP. The roll is not included in the calculation for the turn. Start the turn when passing the PUP. This turn should be made with 3 G (Upper left corner of the HUD). You can find all this information in the "Turn Data Panel". In the picture to the right I have just released pressure on the stick to stop the turn. Make sure you fly tracks and not headings. Track is where the FPM is pointing and not where the nose is pointing. Wind or slipping the aircraft makes the difference of heading and track. To make it easier to get to the correct track an Offset Aim point has been placed. This is the OA2 and it is a triangle. This point in your HUD makes it a lot easier to turn to than turning to a heading. You can also see in the picture that I am not flying exactly 350deg, but just flying to the triangles this will correct small errors.



## The pop-up.



After completing the turn, roll to wings level and start the climb. Pull the nose up with 3 G's until the FPM is at the planned climb angle. In this example it is 40deg. Make only small adjustments to the pitch to keep the FPM on 40 deg up and push up the throttles. You are losing your speed at this time. It is not a big problem to lose some speed at this time but you don't want to lose too much speed. You are flying a path up to the point where you are going to pull down again. Losing speed will make the next turn tighter, but you will do that turn by looking at the target and lining up visually. If you can, take a look at the target. It should be on your right 10-11 o'clock and moving towards your 9 o'clock. If you have an IRTracker you now know what it is good for! The next thing to keep an eye on is the altitude. This is very

tricky. You want to have the height above the target. If you have set the altimeter to Auto the altitude in your HUD is not that height above the target. At very low altitudes it shows the height above the terrain. But climbing a little bit it will give the altitude above MSL and not above terrain. With the nose up high the radar altimeter could be not working or you are flying above a hill that's higher than the target. In the climbing picture you can clearly see that the Radar Altimeter is not indicating during the climb. After a couple of try's you have your own idea about your altimeter setting.

If the target has a very low elevation, don't bother too much and just use the altitude or the radar altimeter. It will give you a small error, but you will get the bombs on the target. When the elevation is high, you can switch your altimeter to barometric.

Estimate if you are on the same height as the target (or a bit lower or higher). Now look at the altimeter and that is about the elevation the target has. The program gives a pull-down altitude of 4693 feet. If the target is at sea level this is the altitude where you start the pull-down. When the target is at a higher elevation, you have to add the barometric altitude to the Pull-down altitude. This all need a bit of practice and you will get your method for this problem.

With 40deg nose up and a speed around 500kts, the altimeter is going up very quickly. So to make it a bit easier the program has placed a point for you again. Note that this point is above the OA2. So if you had the OA2 in the HUD before pulling up, you should see it around the 40deg pitch up. This point is the OA1 and it will help you with the turn to the target. The OA1 is placed at the pull-down point

The roll toward the target is also not included after the pull-down Point. So just before reaching the pull-down point you should have the altitude that you need. Now roll the aircraft toward the target.

## The dive.

Now it's time you start to turn to the target and do the bomb run. What do we know about this part? We know that the dive is planned to be 30deg dive angle. We also know we have to make an 80deg turn (Angle off) to the left and do this all with 3 g's. The combination of the two will make us do a roll to the left that should be more than 90deg bank. The perfect bank is where your lift line is over the Off Aim Point. This is just behind the target. Just before the Pull-down altitude roll the plane and pull the FPM to the Aim Off Point. If you don't have the "Place OA2 at the Aim Off Point" selected in the WDP, you should see a triangle at the right heading and distance behind the target. Pull the FPM to this point. If you don't have the OA2 at the Aim Off Point, you have to estimate

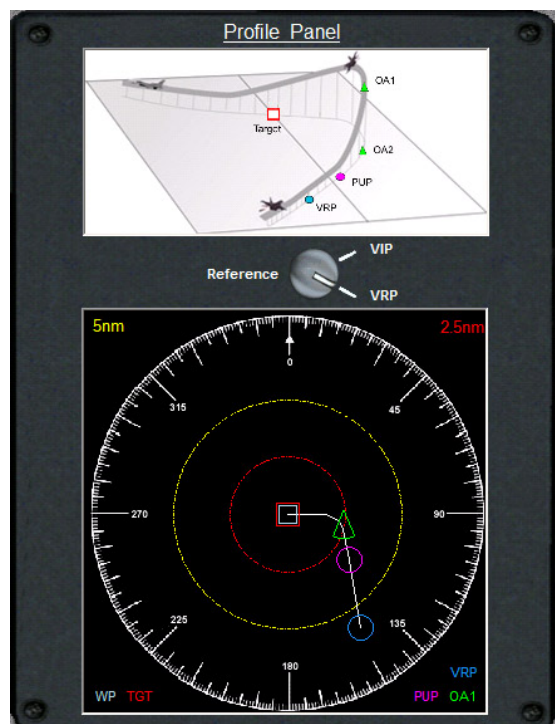
this. In the Advanced Input Panel you can see that it is 2715 at this time. This distance is called the Aim Off Distance.

Also this is what you have to try a couple of times to get the feeling for it. If you don't have an IRTracker, I recommend going to full cockpit view. Then switch the view up 1 time. You can see the HUD now, but also a part above the HUD. This will help you to spot the target as soon as possible and keep a track on the g's you are pulling. You found the target and pulled the nose on it. You see the diamond over the target and your track is 270deg. In the picture to the right you can see that I have already rolled wings level again and that the FPM is at the 30deg down marker of the pitch-ladder. After you have finished the turn you have 5 seconds to roll the wings level and aim. Just maintain the same dive angle; the piper will come up by it self. When the 5 seconds have passed, you crossed the 5.000' where you want to drop your bombs. You can see in the picture that I have been off a little bit. The track is around 275deg and bomb release is at 4300' height.



### Leaving the target area.

If this all worked out as planned, you just pickled your bombs and you are on your way back home. Turn to the heading where you planned to leave the area and get out. You can go back to the deck or do a fast climb to higher altitude. This will depend on the type of bomb you used, the release height and the threat you are facing at this time. That's all there is to it...



### Type 2

The type 2 profile is only slightly different from type 1. The difference is in the approach to the PUP. This is not done in a straight line toward the target, but already with the correct offset. You can see in the picture below that you don't need to make a turn at the PUP and just have to start the pull-up. You will see that this profile is easier to fly. For the picture the same values are used as the one for Type 1. Only the Type has been changed to Type 2.

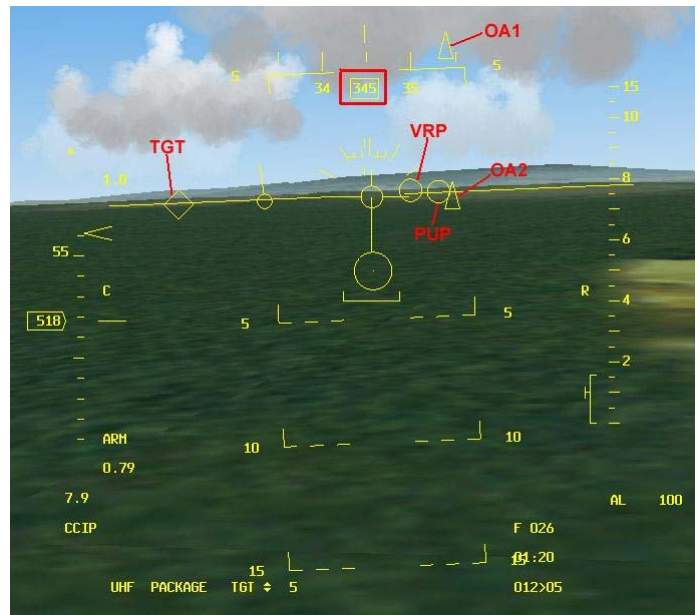
### Approaching the target.

You can approach the VRP from almost any direction you want. It will be a bit easier if the approach is already lined up with the pull-up heading. The goal of this profile is that you over fly the PUP with the planned pull-up track. The VRP is placed in such a way to help you to get on that track lined up with the PUP.

The pull-up heading can be found in the “Turns Data Panel” and is 350deg in this example.

It is always nice that you have planned the attack in such a way that it is easy to find and navigate to the VRP. Use the Profile panel to turn the attack heading so the approach will fit your ingress route.

If you do have a large turn to make when fly over the VRP it is better to fly some degrees left or right of the VRP. Place the VRP at the side of the HUD and just before you get to the VRP, cut the corner on the inside. In the picture to the right you can see the approach to the VRP. Flying left of the VRP to get the VRP and the PUP lined up with the OA2. At this time I just start a slow turn to the right and fly over the VRP to the PUP. How



much before the VRP you start the turn to the PUP depends on your speed, the angle and the amount of G you will use. After passing the VRP the important thing to do now is to fly to the PUP with the planned Pull Heading. Make some small error corrections, but don't make large turns.

### The pop-up.

Just before passing the PUP you have to start the pull-up. Pull the nose up with the planned amount of gs. From this point the profile is exactly the same as Type 1. So for further detail see the chapter about type 1.

### VIP setup.

You have seen in the previous chapter that with a VRP setup the reference point was placed at the target. Now we use another option and let us place the reference point somewhere else. This could be at any position we like, but if we place it on a smart place it can be very helpful to us.

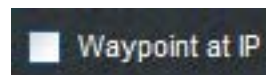
If you have been using this program before, you might have noticed that it sometimes can be hard to find the first point. When you have found it and you are not lined up yet, it can be hard to judge the turn that you will need to make to get onto the right track. And we are not even talking about a high intensity area even. But if the first point would be placed over an object that you can see, it will be a lot easier to fly to.

Try to find an object that you can easily find by radar or by sight and is about 5-10nm from the target. If this object is placed in the direction where you are coming from it is even better. Basically this will be your IP and because you can see the object, it will become the Visual Initial Point.

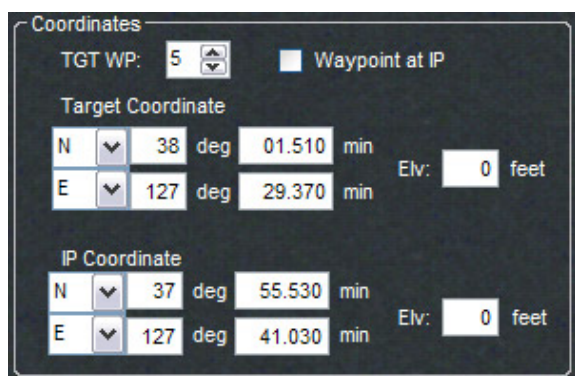
*In real life this will be used to make a radar update of your position so that your navigational precision will be better. In RL your INS will drift and this can be corrected. If you have a GPS installed, this update can be done with this signal. But if you don't have a GPS or it is broken, the navigational position can be updated by TACAN, DME, visual cues using the HUD or by use of the radar. This part can not be done in Falcon, but is nice to know.*

The advantage of this VIP will become clear at the moment you start to use it. First we will start with some recon. Look at your map and look for that object that is on your route to the target. If you have found it, you need to note the coordinates of the object. You will also need the coordinates of

the target. In this example we will use Munsan Bridge as the IP. The coordinates are N37 55.53 E127 41.03

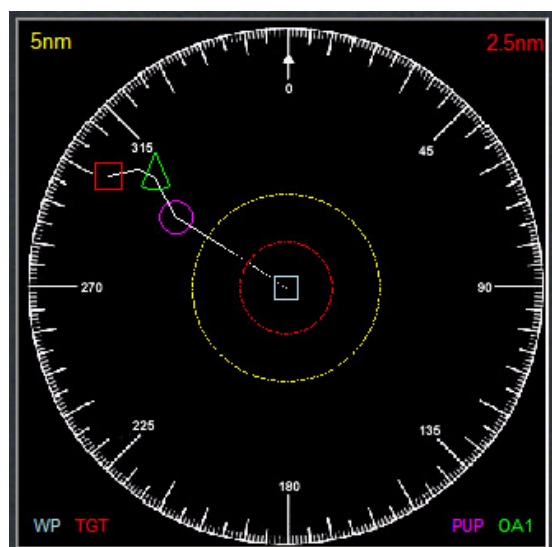
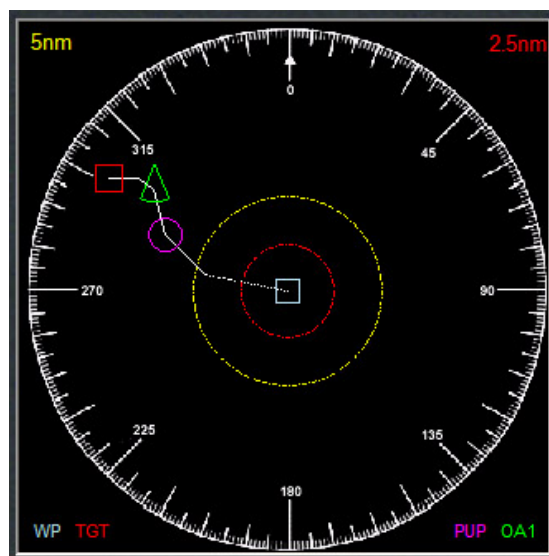


Again we will start with a Type 1 profile. Set the values as before, but now select VIP as reference. A new screen will appear that is called Coordinates. In this field the coordinates of the target and the IP must be set. Start with the number of the waypoint where the target is located. Also uncheck the “waypoint at IP”. If you select this option; the coordinates of the IP will be locked. The IP will be placed at the beginning of the profile. This is not a specific place and basically you have lost the advantages of the VIP setup.



Now insert the coordinates for the Target and the IP. WDP now knows the data that you want to use and also the coordinates of the target and the IP. Have a look at where the points are placed. Select the Profile mode. Have a look at the upper picture. You won't find the VIP here. The VIP can be placed anywhere you want so it is not on the picture. Looking at the lower part, the first difference between VIP and VRP that you might notice is that the target, the red box, is not in the centre of the screen. This is correct.

Remember that the reference point is the IP now and not the target. The focus is on the IP and getting to the IP now. As seen in the picture to the right, you might notice is the angle between the dotted white line from the VIP and the full white line to the PUP. The full white line is the approach path that you have selected with the 'VIP to PUP dist'. You can change the length of your approach path. The white dotted line is the path from your chose VIP and the beginning of your approach path. You can leave all the data as it is and you have to fly that corner all by yourself. You can also change the attack heading so that the white full line is aligned with the dotted line. To do this, turn the attack heading to 257deg. In the picture below you will see that it will become one straight line.



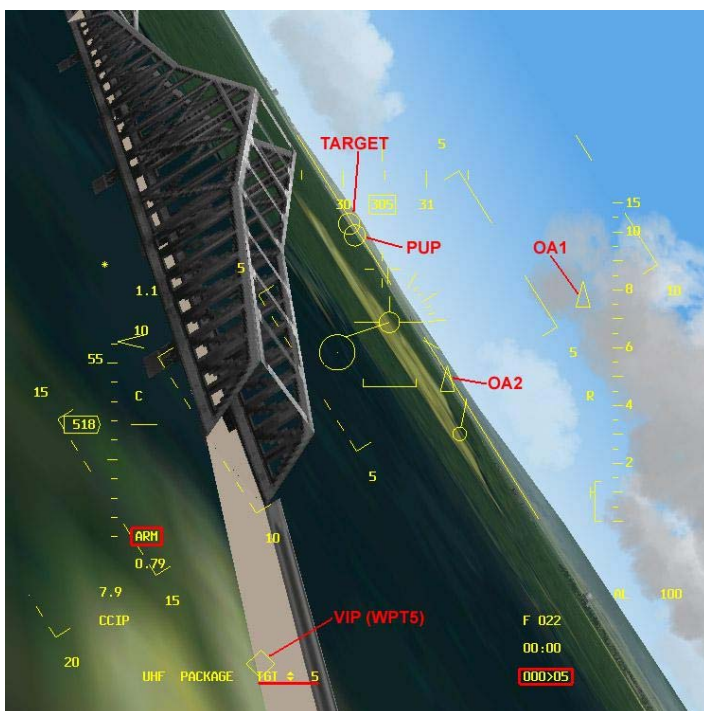
Falcon AF avionics are limited. One of the things you will find that is not correct is the fact that the offset points can only be placed at a waypoint that has been set as a target waypoint. So when you start inserting the data into the FCC, you can insert the data connected to the IP. You have two options here. In the falcon mission planning you can change the IP to a strike waypoint. Or you can take the target waypoint and when you are in the cockpit change the coordinates to the coordinates of the IP. It is important that you have a target waypoint at the right coordinates. The points are placed in relation to the IP, so make sure it is a target waypoint and it has the correct coordinates. How to change the coordinates of a waypoint is described in the chapter: Entering the data in the F-16 computer.



When you have this IP waypoint setup, you can insert the data for the other points. Because the active waypoint is the IP, you will not see a diamond over the target. WDP has calculated the bearing and distance from the IP to the target and by inserting these into the VIP to TGT, the FCC will show a circle over the target. All the other points will remain the same as a VRP setup.

Use the left side of the DED Data Panel that says VIP. When you are in the F-16, go to the VIP page using the ICP. Insert the values for the “VIP-TO-TGT” here. The next point to insert is the PUP. In AF you can’t insert the PUP, so we will use the VRP for that. Go to the VRP page and insert the data for the “VIP-TO-PUP”. The OA’s can be inserted as normal. What you have gained by this is more flexibility and you can now easily navigate yourself toward the IP. It will be a waypoint that you can see on your HSD and you can see it as an object. Also with the use of the tadpole on the HUD you will be able to get to the correct approach path faster and easier. This is the whole objective of this setup. Even if you lose all the HUD points, you can still fly this by leaving the IP with the planned track. As you get to the planned distance from the IP, just do the pop-up as planned.

There is another advantage of the VIP setup. If you are doing the attack as a two ship, you can now use the same IP but both use different attack profiles. By this you can stay close to each other until the IP. You can better time the passing of the IP.



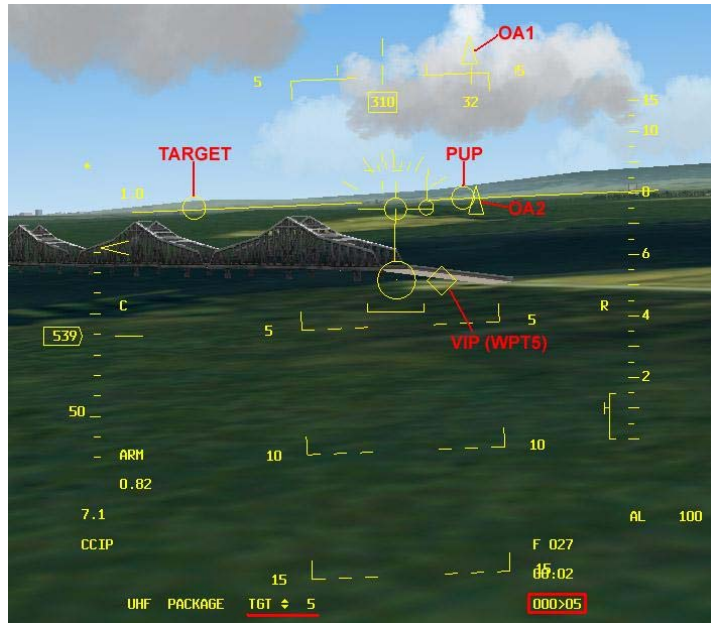
In the picture you can see the approach to the VIP. The VIP is the diamond and the target is now a circle. You can clearly see the bridge and fly towards it with a heading of 300deg. If you don't have this heading already, you can now easily lead the turn towards the planned track. As you can see in the picture, you can be a lot more aggressive and still keep your situational awareness. Also note that in the example picture to the left I have chosen to take the target waypoint 5 and change the coordinates to the bridge.

Again the avionics of Falcon AF will not help you much from this position on. In real life, and other versions of Falcon, you have the option of placing the radar cursor at the Reference point, OA1, OA1 or the target.

This will help a lot with navigation, but this option is not included in AF. You should also be aware that if you change your active waypoint from the target waypoint to any other waypoint, you will lose the visual cues in the HUD.

From this point on the pop-up is flown the same way as the VRP setup. Depending on the use of a Type1 or a Type2 profile fly the pop-up as planned. When you are turning to the target, don't expect to see a diamond over the target. It will be a circle in a VIP setup.

For the Type2 the approach to the VIP looks like the picture to the left. Passing the VIP, fly towards the PUP and OA2. In this example I have turned the attack to 235deg. This made sure the VIP, PUP and the OA2 are lined up. Passing the PUP, start your pull up like you have been doing before. Roll to the left and pull the nose toward the target. In the picture to the right you can see that the attack heading of 235 doesn't line you up with the building, but releasing two MK84's will do the job here.



## Extra features

### Using the OA2.

If you want, you can place the OA2 behind the target to help you aim. If you select this option the OA2 will be placed behind the target. It will be line-up and is placed at a distance which will correspond with the Aim Off Distance. This is the distance that you will have to aim the FPM. When you have the FPM at this distance behind the target and you have the planned dive angle, the piper will be at the target when you reach the planned release height.

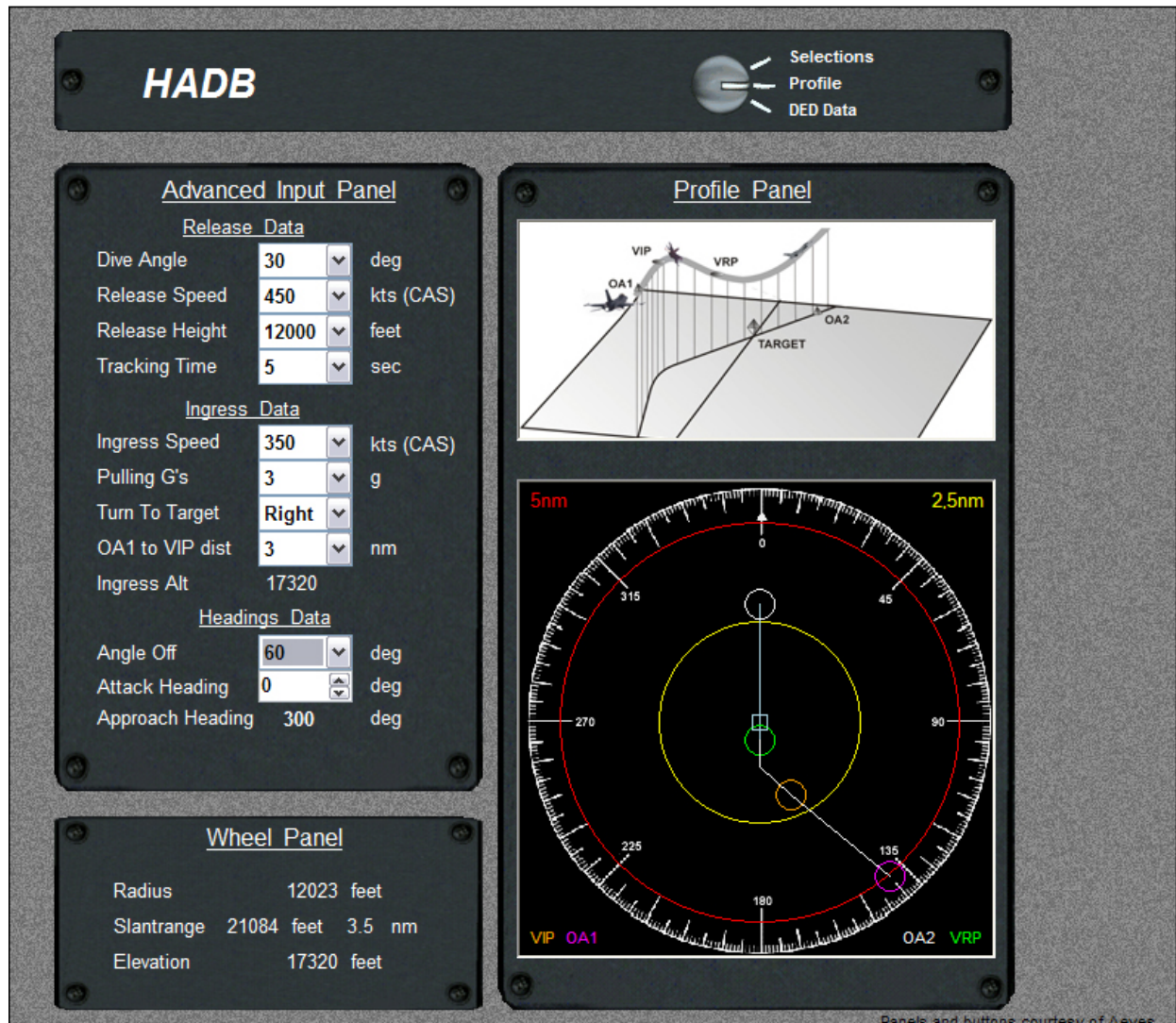
### Changing the VIP to PUP distance.

You can set the distance between the VIP and the PUP by yourself. In "Auto" the distance will change automatically. It has the value of 2 times the action range. But in a lot of cases this is too long. It is nice to use this setting in the beginning to get an idea how the profile works. Later you can set it to low values like 1 or 2nm. This will get you close to the PUP and less time to correct, but you can manoeuvre more before you get to the start of the profile.

## HADB.

The choice has fallen on high altitude ingress. So there you are at 20,000' and wondering where you want to roll in and start the dive. Start too early and you will get a shallow dive and you have the chance to get below the planned minimum altitude over flying a lot of AAA. When this happens you will see one or more smoke trains coming up and these are not firecrackers for the celebration of a happy new year.

Roll in too late and you could end up missing the target completely or end up in a steep dive and get below the planned altitude again.



The whole idea of the high altitude dive bombing is to stay above the possible threats. Choosing the correct release altitude is the first thing to do. So you are back to step 1 for the mission planning. Do some good recon. This doesn't mean just clicking on the recon screen and have a look around. Keeping track of the complete war would be nice, but that is a bit too much to ask for. But knowing what kind of weapons the enemy might have is a good thing to do. Look for battalions that have the SA-13 or the 2S6. Also the radar guided AAA is a threat at lower altitudes. Check for the ZSU-23-4. If you know the enemy has them and you are not sure if they are in the area, just count with them for this mission.

So let's say the enemy got the SA-13 in its arsenal and you want to hit a power plant. The SA-13 will shoot at you up till an altitude of around 11.000'. If you choose a release height of 12.000' or a bit higher you should be okay. From the recon screen it was not clear if the power plant is defended by AAA or SAMs, so just count on it that it will be.

### The advanced input panel.

Now the planning of the attack will start. The Selection panel is of the same design as with the pop-up so I don't think much explanation is needed. I will also only explain the use of the advanced panel. If you know how to use this one, it is only easier to use the simple panel.

The advanced panel is been divided into three sections. The first part is the Release Data. In this part you have to make the decisions for the bomb release. Staying above the minimum height is the most important thing to do. Because of this, the release part is also the first thing to set.

- Select a Dive angle for the bomb release.
- Select the Speed at which you plan to release the bomb.
- Select the Release Height to stay above the threats.
- Select the Tracking Time to roll wing level and aim.

The second part of this panel is about the ingress.

The program wants to know how you plan to do the ingress. The first thing you might expect here is an ingress altitude. And that is actually not the case. As said before the main goal is to stay above the threats and not the route towards the target. The combination of the release height, dive angle and tracking time will give you an ingress altitude. If you would like a higher or lower ingress altitude, just change the tracking time and the ingress altitude will change with it.

But the program needs to know the following.

- Select the Ingress Speed.
- Select the Pulling G's with which you want to turn in and dive.
- Select the Turn direction that you want to use to turn to the target.
- Select the distance for the two points that you will over fly during the ingress. The distance between the OA1 and the VIP.

The screenshot shows the 'Advanced Input Panel' with three sections: 'Release Data', 'Ingress Data', and 'Headings Data'. Each section contains several adjustable parameters with dropdown menus and numerical input fields.

Release Data		
Dive Angle	30	deg
Release Speed	450	kts (CAS)
Release Height	12000	feet
Tracking Time	5	sec

Ingress Data		
Ingress Speed	350	kts (CAS)
Pulling G's	3	g
Turn To Target	Right	
OA1 to VIP dist	3	nm
Ingress Alt	17320	

Headings Data		
Angle Off	60	deg
Attack Heading	0	deg
Approach Heading	300	deg

If you have a look at the ingress speed it looks a little bit low. But flying at a higher altitude the selected CAS will give you a much higher TAS. For more explanation of this have a look at the note about the CAS and TAS on page 6.

The third and last part of the panel is the heading data. In this part you can control the attack heading and the amount of degrees you want to turn. The program will give you the approach heading that you will have for the attack.

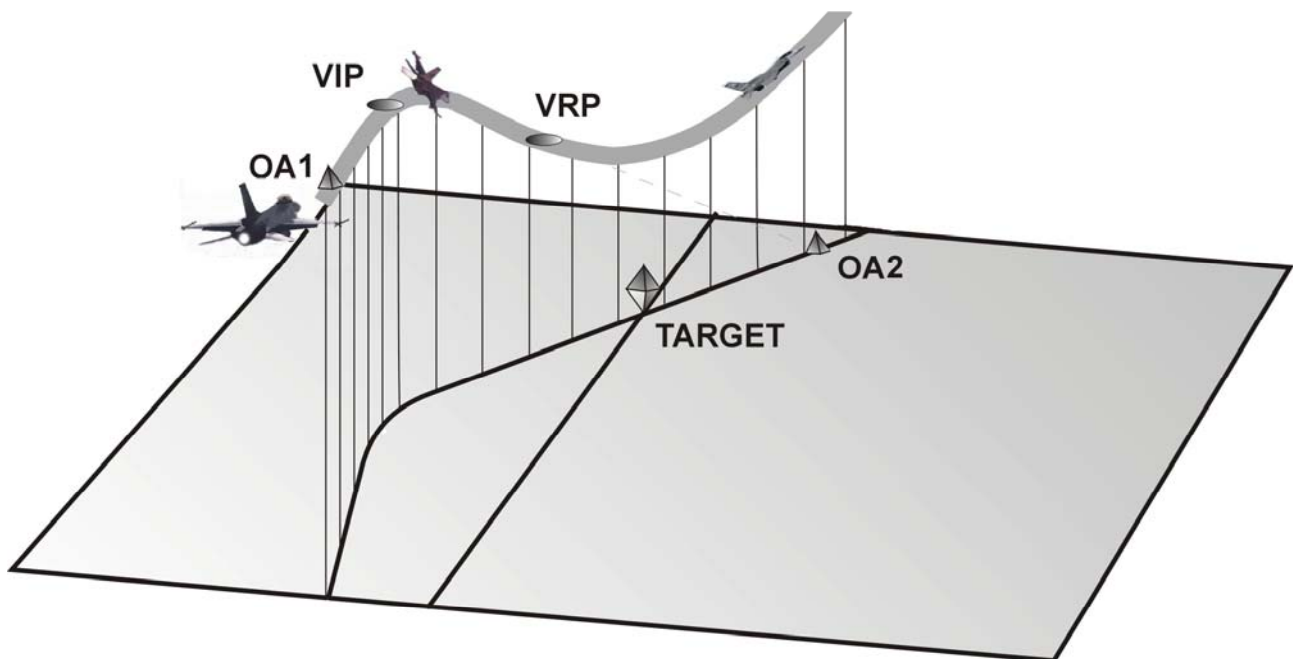
### The wheel.

As you can see there is another information panel that is called Wheel Panel. In this panel you will find all the information that you will need if you want to fly a coordinated attack with a 2 ship. It will give you the radius, slant range and elevation for the wheel. How this will be used you can read in the next section.

Wheel Panel		
Radius	10926 feet	
Slant range	19946 feet	3.3 nm
Elevation	16687 feet	

### How to fly the HADB profile.

This profile is probably the easiest profile of all. It is basically nothing more then what you were doing until now. Just dive down and drop your bombs. Then order a new coffee from the nice stewardess and be home before dinner. (Life can be so good ☺). Get your head out of that cloud and start to fly a planned profile.



For information about setting the data into the F-16 Computer and how to setup your bombs, please refer to the chapter: Entering the data in the F-16 computer at page 31.

As you can see in the picture above you start at a safe high altitude and line up the OA1 and VIP. The elevation of the ingress has been set at about 17.000'. It is not that important to fly this altitude exactly as possible. But having the OA1 and VIP in the HUD would be nice. In this example the attack heading has been set to 0 deg and the angle off at 60 deg. When you over fly OA1 and you are on your way to the VIP your heading will be 300 deg. This is the time that you should be finished with your setup. Got the correct weapons selected? Got the release pulse and impact distance as you want it? This should be done when you have time and not under a lot of stress.

When you are line up with the OA1 and the VIP, have a quick check if the Master arm switch is set to ARM. Now it is time to focus on the target. I have chosen to do this attack with a CCRP mode and as a backup I could switch to CCIP. Passing OA1 at an altitude of 17.000' and a speed of 350kts CAS, will give me a groundspeed of 443kts (no wind). The VIP is 3nm behind the OA1 and that will give you about 25sec to get a good lock with the ground radar after you have passed the

OA1. Getting a good lock also means looking at your target with DSB1 or 2. And that will take you a bit longer than 25 sec! So get your radar work done as early as possible. Some versions of falcon will place the radar cursor very precise over the correct target. When you have entered the coordinates of the target as the exact coordinates of the target waypoint, your life will become very easy. Just locking up the target will do in this case.

Just before the VIP roll the aircraft to the correct bank. You should roll it so the lift line is over the OA2. At the VIP, start to pull the nose toward the target. This should be done with the chosen amount of gs.

When you start turning it is about time that you give the computer the command to release the bombs. So push down on the weapon release button and hold it down. If you don't do this in time, the chance is that you will fly past the release point and you won't have a release of the bombs. When finishing the turn you should aim over the target so that the FPM is at the same level as the OA2. Now you should have the planned dive angle. If it is a little off it doesn't matter so much. Make sure the bomb line is over the FPM and the bomb should release when you pass the planned release altitude. This is also the place where the VRP is placed.

If you loose radar lock, or come out completely wrong, switch to CCIP and aim using the visual cues. When you descend through the planned release altitude start to pull up. If the bomb won't come off you could have miss aimed or missed the release point. Pull up anyway!!! You don't want to get inside the shooting range of the SA-13 and ZSU-23-4.

At this point you could have two options. Or your bombs came off nicely and you are on your way home, or the bomb didn't come off. If they didn't come off, try to find out why. But do this only when you are in a safe area. If you still have enough fuel and it is still safe to stay in the area, you could have another try. Don't forget that the enemy knows that you are coming this time.

### **Flying the wheel.**

The wheel is a quick and easy way to get you into position to start a dive to the target at any time. The idea is made for a 2 ship flight. When number one is diving to the target, number two is circling high and above. The one that is circling can have a good look at the area around the target and can report any missiles or AAA going for the attacking plane.

In your HUD you can see the slant range to the target. This is given in the lower right corner of the HUD. If you stay at the given ingress altitude and making a circle around the target, keeping this slant range the same. When you have these values you are always in the correct position to start a dive attack with the planned values.

### **Also use for.**

For this attack profile there are a lot of other uses. When you get a chance to fly a bomber and want to do a planned attack, the use of these points in the HUD are very useful. Select a low dive angle like 10deg and a high release altitude. Also check if the heavy bomber can fly the selected amount of G's.

This planning is also very useful if you are attacking with laser guided bombs.

## TOSS.

The TOSS delivery is not just one delivery. It should also not be mixed up with DTOS.

DTOS is a FCC (Fire Control Computer) mode in the F-16 and TOSS is just the English word for throwing something up in the air.

You can basically divide the TOSS into two sections. A Medium Altitude TOSS (MAT) and a Low Altitude TOSS (LAT). For now the LAT is implemented only.

Weapon Delivery Planner 1.2 beta

Options Help

Weapon Delivery Planner

Plan to strike...

Pop Up

HADB

TOSS

Speeds, Alt and Turns

Threat Info

Munition Info

Exit

Made by Cain, Falcas, Burger

### TOSS

Mode: Profile

Selections  
Profile  
DED Data

#### Advanced Input Panel

Ingress Data

Dive Angle: 0 deg  
Ingress speed: 550 kts (CAS)  
Ingress Height: 500 feet  
Pulling G's: 3 g  
Turn To Target: Right  
OA1 to VIP dist: 3 nm

Release Data

Release Angle: 30 deg  
Release Speed: 450 kts (CAS)  
Release Height: 5500 feet

Headings Data

Angle Off: 60 deg  
Attack Heading: 0 deg  
Approach Heading: 300 deg

#### Profile Panel

10nm 5nm

VIP OA1 OA2 VRP

#### Extra Info Panel

TAS at release: 535 kts  
MAP: 37683 feet  
BombRange: 29023 feet

Panels and buttons courtesy of Aeves

### Low Altitude TOSS.

As it already says, this is a low altitude profile. The idea for this delivery is to fly in low and below the radar and also give you some distance from the target at the same time. You will toss the bombs from a distance and turn away before you over fly the target. This will give you the advantaged of surprise and you stay as far as possible from the target.

The disadvantage of this delivery is that the accuracy is lower then the other modes. So you have to select this profile only when everything fits to the occasion.

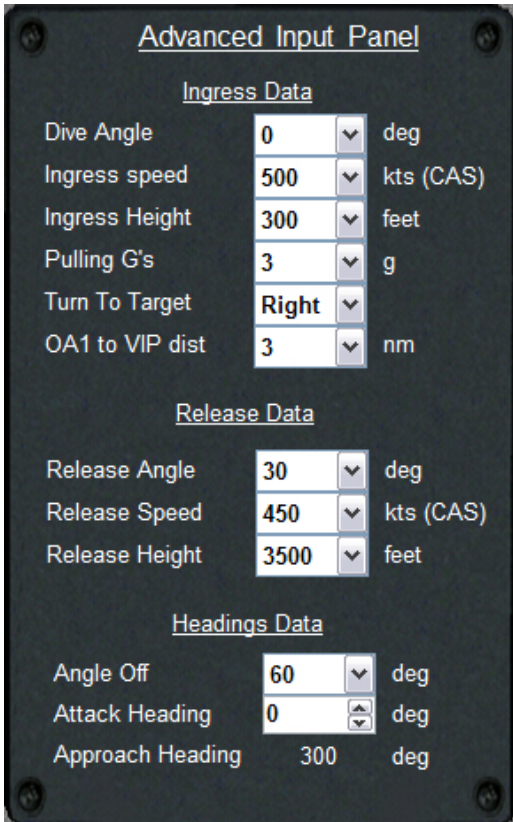
Using guided weapons is a good option, and also cluster bombs will fit very nice. Dumb bombs are not so good for this profile because you will probably miss the target unless the target is very large like a hanger.

## The advanced panel.

The advanced input panel is the same design as the one from the HADB. It is also divided into three sections. For this profile the first thing the program wants to know is the data for the ingress. With a known ingress the program will calculate the possible release heights that will fit the profile. So let us start by making the selections for the ingress.

- The Dive angle for the LAT is always zero. This is for later when the MAT is included.
- The Ingress Speed.
- Select an Ingress Height.
- Select the amount of G's with which you want to pull up.
- Select a turn direction if you want to fly a turn before you get lined up with the target.
- OA1 to VIP dist. Select the distance between the line up point and the pull up point.

As you might have noticed the release height will change automatically when you change the ingress height. When it changes the program will set the lowest possible release height and also add a few higher heights.



The screenshot shows the 'Advanced Input Panel' with three sections: 'Ingress Data', 'Release Data', and 'Headings Data'. Each section contains several parameters with dropdown menus and units.

Ingress Data		
Dive Angle	0	deg
Ingress speed	500	kts (CAS)
Ingress Height	300	feet
Pulling G's	3	g
Turn To Target	Right	
OA1 to VIP dist	3	nm

Release Data		
Release Angle	30	deg
Release Speed	450	kts (CAS)
Release Height	3500	feet

Headings Data		
Angle Off	60	deg
Attack Heading	0	deg
Approach Heading	300	deg

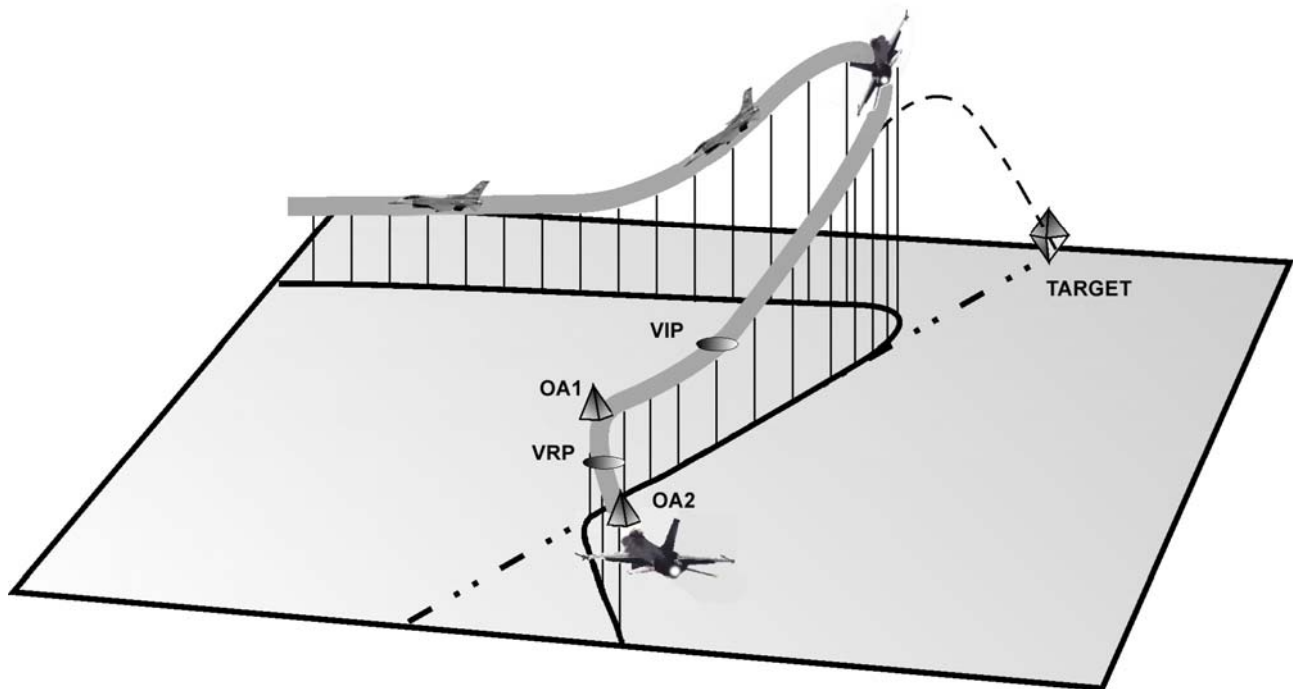
When the ingress data is set, have a look at the values for the release.

- Set the release angle. Because this is a toss this value is always up.
- Select a release speed. This can be the same as the ingress speed or faster/slower. You have to decide for yourself if you can fly the speeds selected.
- Select the release height.

If you don't want to plan any turns before the line up, the profile is done. But if you want to plan a turn to get to the planned attack heading it can be done using the heading data.



## How to fly the LAT profile.



I will discuss a TOSS profile with a turn. When you don't want to fly this turn you will end up without the OA2 and the VRP.

For information about setting the data into the F-16 Computer and how to setup your bombs, please refer to the chapter: Entering the data in the F-16 computer at page 31.

Get yourself lined up with the OA2 and the VRP. Check the master arm switch! Try to get a lock, but don't fly into the ground. If there are a lot of hills around the target, it is nice to stay below the radar, but could be hard to get a radar lock yourself. When you have done a good recon you know about the surroundings and have chosen a higher ingress height or you just know you can wait until you get lined up with the target. It is even possible to get a radar lock when you are climbing for the bomb release. Getting close to the VRP you get ready to making the turn to the attack heading. At the VRP the turn should be started and after the turn you get the OA1 in the HUD for only a very short time. At this time the important thing to focus at the VIP and the target. Get these two lined up. If you have a radar lock at this time you can do two things. Or you follow the cues from the FCC that can be seen in the HUD, or you follow the pre-calculate point.

When you follow the FCC calculations, pull up when the first cue comes to the FPM. Pull up until the FPM is at the planned release angle. Now would be a nice time to give the bomb release command. So press the weapon release button and hold it. You will see the second cue come down towards the FPM. When this second cue comes together with the FPM, the bomb will be released. When you choose for the pre-calculated points or if you didn't get a radar lock yet, continue to fly until you get to the VIP. Passing the VIP start to pull up and get the FPM at the planned release angle. If you didn't have a radar lock yet, try to get one as soon as possible. If you get a lock, press down on the weapon release button and hold it down. The FCC will calculate a release solution as soon as you get a radar lock. So no matter what which angle you fly at this time, the release cue will come down and as soon as it will come to the FPM the bombs will be released.

So which of the two should be used, the FCC calculation or the pre-calculated points? I would use the first pull up point that I would pass. If that will be the FCC cue or the VIP doesn't matter. This way you will avoid that you will over fly the target at 100' and won't release the bombs.

After the bombs came of the rail, turn hard to the side to stay clear of the AAA. Turn to the planned egress area and regroup.

### **Medium Altitude TOSS.**

This is not implemented yet.

## **Speeds, Altitudes and Turns.**

Did you also wanted to know about the relation between altitudes, temperatures and speeds? Then have a look at this part of the program. This can also be used for planning a route. Looking at the relation between CAS and TAS you can see how fast you are actually moving through the air. If you take the wind into this calculation you know how fast you are moving compared to the ground. This can give you a nice idea how long it will take to get from A to B when you fly at low level or at a high level.

## **Threat Info.**

Knowing everything about the threats that you can encounter is a big part of the planning of an attack. So I included a database with all the data that I could find. Because there is so much data to find and also so many different versions of weapons, I made the database as an open database. This means you can change or add data as you like.

## **Munition Info.**

Now that you know everything about your target, you also want to know which weapon you can use to destroy it. Here you can find all the data that you need. This is also an open database so you can add or change data as you like.

In the lower left corner you can find a small selection panel. This is for the Minimum Release Altitude. This will give you an altitude at which it is safe to release the selected type of bomb. This depends on the speed you are flying. If you fly low and slow at the time the bomb explodes, you are still inside the bomb blast and you will get damage.

This part is not working completely yet, but I left it in the program so you can have a look at it.

## **Useful Tools.**

### **Printing.**

Printing the data is now possible. It is set for landscape printing and formatted so it only uses the half of the page.

If you print it on an A4/letter size page and fold it in half, it is a nice format to put on a kneepad.

### **Text file.**

With every change you make in the program, a text file is made. You can find this file in the Weapon Delivery Planner folder. You can use this file to print the data or send it to your squad, after you have closed the program.

## Entering the data in the F-16 computer.

How do we use all this data and where can we put it in the F-16's computer? As said before, you can only insert four visual cues that will be displayed on the HUD. You can only see them if you are in NAV or A/G mode when the target waypoint has been selected. The program gives the data for the VIP, VRP, PUP, OA1, and OA2.



### The ICP and DED.

The Integrated Control Panel, or ICP is used to enter the data.

This is the "keyboard" in the F-16. The changes and inputs given in the system can be seen on the



Data Entry Display or DED. Go to your cockpit and start her up. When you have prepared the aircraft for taxi, it's time to insert the reference points.

The first thing to do, and this is a must, is select the waypoint that will be the reference point. With a VRP setup this will be the target and when you use the VIP setup, the reference waypoint needs to be set.

### Changing a waypoint coordinates.

If you want to change the coordinates of a waypoint for precision or setting of the IP, first press LIST on the ICP.

You will see a listing of all the options for other pages.

Select the destination page by pressing the "1" button on the

ICP. On this page you can see the selected waypoint and its

coordinates. Make sure you want to change this waypoint. Using the ICP you can change the

coordinates. After typing the coordinate, it has to be accepted with ENTR. WDP gives the coordinates with 3 decimals. This is as it is in real life. Falcon AF only has the option for 2 decimals, so make sure you have the coordinates inserted as you wanted.



### Inserting the points.

On the ICP click the LIST button and then select the (3)VIP or

(9)VRP. Select the VIP option by clicking on the ICP 3 button.

Insert the data given by WDP. The first thing you enter is

TBRG (Bearing). All the headings/bearings should be inserted

with one decimal. So bearing 303.2 should be inserted as

shown in the picture. This is done by use of the ICP and the data is entered in the system by

clicking the ENTR button. Now do the same with the RNG (Range) and finish it with the ENTR

button. Optionally you can insert an elevation, as you want. You have now programmed the VIP.

Inserting the data for the VRP is exactly the same.



The next points to program are the OA1 and OA2. First click the DCS (Data Command Switch) to RTRN to set the DED to the default mode. Just to make sure, have a look at which waypoint is selected. Now go to the LIST again. You have to select the DEST page by clicking the 1 on the ICP. Go back to the DCS and click on SEQ (right). You should now be in the

OA1 page. Insert the right data from the

program like you did for the VIP. Again click on SEQ and you

are in the OA2 page. Insert the data for OA2 and complete it

by pushing the ENTR button.



For the ones who know how to navigate with the HSI (Horizontal Situation Indicator), this is also the time to set the course for the OA1. With this selection you have a good backup to navigate to this point. You could fly the pop-up with the HSI only, but it is a lot easier with the visual cues.

### Setting the Release Angle.



For this delivery you will be using the CCRP mode of the FCC. This mode will need a radar lock before it can release the bomb. In this case we want to release the bomb when we are flying up and the pitch should be at a plan angle. The FCC needs to know at which angle you want to release the bomb. Together with the radar lock and the planned release angle, it will calculate when you should pull up and it will also release the bomb at the right point. So where do you tell the FCC what the release angle will be?

As an example I will be using 4 CBU58's and as you can see in the picture to the left I have already selected them.

In the middle of the screen you can see what the FCC thinks what the planned release angle is. 23deg is the basic setting that you will find here.

In the upper right corner you will find the option CNTL. This stands for Control and it will select the page where you can control all the settings for the bomb that you have selected. So push the MFD5 button with the CNTL function and you will see the page as can be seen in the picture on the right. At the left you can select the functions for the Arming Delay and the Burst Altitude, but at this time we want to change the Release Angle. You can find this on the lower right bottom of the screen. Again you can see that 23deg has been set and by pushing the button MFD10 to the right of the text, you will go to the page where you will change this value.



So you made it to the correct page. And again you will see the value that has been set. And still it is 23deg. For this example I would like to change it to a release angle of 30deg.

With the use of the MFD button, select the value you want. If you don't want to change anything just push the RTN (return) function. When you have made a mistake and would like to correct it, you can use the RCL (recall) function.

When the value is chosen, you have to insert this value by the use of the ENTR (enter) button. You will get back to main weapon page and now you can see that the correct value has been set.



## **Word from the author.**

I started to make this 'little' program because I got more and more interested in the strike mission. Reading all the material, I found that the way of use of the visual reference points, was different between the SP3 manual and the MCH 11-F16v5. After making the first calculations on a piece of paper I found it too much work to have fun with falcon this way. But if I had a program that would do all the calculations for me, it would be a different ball game all together. So I started making an Excel sheet that would do all those calculations. Because Excel has its limitations, you have to have the Excel installed. So I started learning to write programs and this is the result. Using this program it is a lot more fun to plan and fly a complete mission. It gives an enormous amount of joy when it works as planned. I know that there are still some problems and I hope to solve some of these. I wish everybody a lot of fun with the program.

For feedback, questions or tips how to improve, contact me by Email: [burgers6@xs4all.nl](mailto:burgers6@xs4all.nl)

## **New Features and changes.**

### **Weapon Delivery Planner 1.3.**

#### **Main.**

- Separate versions for Falcon Allied Force and Open Falcon.

#### **Pop-Up.**

- Positions of point are move to correct place according to MLU-M1.
- Difference made between VIP and VRP.
- Coordinates are now included to work with the TGT and IP waypoint.
- Drawing in the profile mode now with colour coding.

### **Weapon Delivery Planner 1.2.**

#### **Main.**

- Printing of the Pop-Up, HADB and TOSS has been improved.
- The overall programming has been improved.
- Problem with the language setting solved.
- Complete rewrite of this manual.

#### **Pop-Up.**

- New layout with working buttons.
- Simplified Input improved.
- Combo box list are now more logic for Dive Angles and Heights. Higher values are higher in the list.
- DED font colour changed to yellow.
- In the Profile view: black background and a compass rose included for better understanding.
- Weapon Delivery Mode that will fit to the attack is now given in the Selection Panel.

#### **HADB.**

- New layout with working buttons.
- Simplified Input included.
- Combo box list are now more logic for Dive Angles and Heights. Higher values are higher in the list.
- DED font colour changed to yellow.
- In the Profile view: black background and a compass rose included for better understanding.
- Ingress Altitude is shown in the Simple and Advanced Input Panel.
- Weapon Delivery Mode that will fit to the attack is now given in the Selection Panel.
- Some bugs killed.

#### **Speeds and Turns.**

- New layout.

#### **Threats Info.**

- New layout.

#### **Munition Info.**

- New layout.
- Extra information added.

**New.**

- TOSS is now added. For now only the Low Altitude Toss (LAT).

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**Weapon Delivery Planner 1.1.**

**Main.**

- Bomb range is now a calculated value and not an estimation.
- TAS is now calculated via MACH and is more precise.

**Pop-up.**

- Better calculation due to the calculation of the bomb range.
- Lower release heights for small dive angles added.
- Simplified input added.
- Ingress height added.
- In Advanced mode, the Tracking Time for Height 2000' and lower available up to 10sec. This is done to have enough time for locking the radar and laser when using LGB's.

**HADB.**

- Better calculation due to the calculation of the bomb range.
- Simplified input added.

**Speeds and Turns.**

- Mach is added.

**NEW.**

**Threats Info.**

- Includes information for the ground threats you may encounter. Like AAA, SAMs and Radars.

**Munition Info.**

- Includes some information about munitions.
- Calculates the MRA (Minimum Release Alt) for the bomb selected, this is for a level constant speed release. (For now)
- Calculates the TOF (Time Of Fall) for the MRA. This value can be used to insert as the Arming Delay and will keep you safe from your own bomb blast.

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**Weapon Delivery Planner 1.0.**

- More planners included into 1 program and thus a new name.
  - Totally new layout to fit the new program.
  - HADB first release.
  - Speeds are now selected in CAS, the program will do the rest.
  - Better Profile view
  - Target in HUD added
  - Errors corrected
  - New manual WDP1.0
-

### **Pop-Up Planner version 1.2.**

- Better layout for the main screen.
- High Drag bombs are included.
- A satellite view has been made for better understanding where the points are.
- Printing has been added.
- A “Popup.txt” file is made with every change in the program.
- The heading selection has been improved. Now you can hold the up/down button and the values will scroll through 360 degrees.
- Manually selection of the distance between the OA1 and VIP.
- The latest values you have used are now being saved when closing the program.
- When opening the program again, these values are still selected.
- Manual is updated to version 1.2. A lot has been changed or added.
- Added some eye candy.

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### **Pop-Up Planner version 1.1 beta.**

- Better calculations formula's
- More pictures in the pictures field. Now all possibilities for left and right are included
- For all the headings and bearing a decimal has been added. Now the points are placed even better.
- Manual is updated to version 1.1beta.

### **References.**

- All the Falcon4 manuals
- SP3 Manual
- RP5 Manual
- MCH 11-F16 Vol5
- MLU-M1
- [www.FAS.org](http://www.FAS.org)



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