Falcon BMS Helipack 0.2

Theater Manual 0.2.0

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1   Quickstarter Basics

1.1 What is this?

Helipack is a 3rd party theater for Falcon BMS 4.35 based on the stock KTO theater. The main difference is that it allows human-flyable helicopters. This theater is based on the belief that flyable helicopters would drastically improve the already-excellent environment of Falcon BMS. See section 2.1 on our Philosophy for more information.

Figure 1: Two parked AH-64s.

1.2 Is the Flight Model accurate?

There are many technical challenges that prevent us from achieving a perfect flight model. We make no attempt to say that our flight models are accurate; on the contrary, we know they are not even close to being accurate. See section 2.1 on our Philosophy for more information.

1.3 How do I install?

For the latest instructions, check the Github Readme.md file. The basic instructions are to place the Helipack directory inside your Falcon BMS 4.35\data directory. Ensure that it is named "Add-on Helipack" without the quotes. The theaters.lst will have to be updated.

1.4 How do I fly?

The short answer is that you set your VTOL takeoff angle to 90° and give it some throttle. This will require you either to bind the VTOL callbacks or else to use the default keyboard bindings. See Section 3.2 for a walkthrough on the first training mission, which is meant to familiarize yourself with flying.

All aircraft in Falcon BMS are Vipers dressed up as other aircraft, although with differing flight models. The helicopters in this theater are no different. They use the Harrier flight model and Viper avionics. The F-16 ramp start procedure works for these helicopters. The main difference in flying these aircraft is that they are meant to be flown with VTOL set to 90°.

Lastly, be aware of your "never exceed speed." For all variants of the AH-64, this speed limit is 197kts. Anything beyond this will bring the distinct possibility of damaging the helicopter.

1.5   How do I add this to another theater?

As development for this theater is still in its early stages, we hesitate to provide a list of changes at this point. Hopefully, this should change in a future release. We would definitely encourage people to include flyable helicopters in their theaters when the time comes!

2 On the Theater

2.1 Philosophy

2.1.1 Purpose

- Human-flyable helicopters are an asset for Falcon BMS.

- We hope that human-flyable helicopters are picked up by the Falcon BMS developers and officially supported, eventually making this theater obsolete.

2.1.2 Accuracy

Figure 2: An AH-64D can carry up to 16 AGM-114 missiles.

- The flight models are NOT accurate, nor do they have to be accurate to make our point that Falcon BMS would benefit from official dev support for flyable helicopters. With that said, if the reader wishes to contribute to the flight models, we are interested.

- The weapons and loadout may not be accurate. We are open to the idea of changing these, but we believe that these types of changes are best slated for official dev support.

2.1.3 Graphics

- Art assets such as new cockpits and additional models are nice but not 100% necessary at this point, as this project is supposed to be temporary. We value the flying experience over the graphics. With that said, if the reader wishes to contribute to the graphics, we are interested.

- We would prefer that any 3D cockpit for any of the helicopters provide controls for F-16 avionics. For example, an AH-64D cockpit should have an ICP with all of the F-16 ICP buttons, even if they are done in the art style of the AH-64D and in the position where one might expect to find something in the AH-64D resembling the ICP. We want people to be able to ramp start in the pit with buttons and switches that are accurately labeled. When BMS gets custom avionics, only then would full fidelity cockpits would make sense.

2.2 Technical Hurdles and Limitations

For a complete list of current problems, please see the Trello in Section 6. The following incomplete list should provide some idea of the challenges to this project:

- Rotor blades for the current helicopter models move only slightly in connection to player input. The rotor blades do not spin normally. Although they move slightly, they give off a perception as if they are completely stationary.

- Humans cannot spawn in helicopters on the ground at Army Bases.

- The AI cannot fly the helicopters once they are converted to be human-flyable. They crash pretty sadly.

- ATC is not prepared to handle helicopter arrival and departure.

- A human pilot cannot land the helicopter on a helipad.

- The landing gear must be retracted after takeoff, even if the real helicopter doesn't support gear retraction.

- Humans aren't allowed to use trainable guns; the gun is fixed.

Figure 3: Soldiers, including those holding SA-7 and SA-14 hand-held launchers, are visible in this theater. These soldiers are incredibly tiny.

2.3 Feature Improvements to Stock KTO

This theater introduces some fixes and improvements to Falcon BMS.

- Soldiers are visible in 3D.[1]

- Rocket pods do not fire all of their rockets when the weapons release button is pressed. Pilots have the option of firing in single or pair.[2]

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1   This change has been incorporated into a future Falcon BMS version.
2   This change may be incorporated into a future Falcon BMS version.

- AH-64E has ammo for the gun.[3]

2.4 Available Helicopters

Nationality	Helicopter	Has Radar	Fuel	Never Exceed Speed	Guns	Rockets	AG Missiles	AA Missiles
American	AH-64A	No	2442lbs	197kts	30mm M230	LAU-3/A /HE (G) LAU-3/A MPSM (G)	AGM-114 Hellfire	N/A
	AH-64D	Yes						AIM-92 Stinger
	AH-64E	Yes						
	AH-1S	No	2086lbs	190kts	20mm M39-2	LAU-3/A /HE (G) LAU-3/A /MPSM (G) LAU-68/131 /HE LAU-68/131 /WP LAU-68/131 /MPSM	AGM-114 Hellfire BGM-71 TOW	N/A
Russian	KA-52	Yes	2500lbs Tank 550li	189kts	GSh-23-6	B8V20-A	AT-9 AS-10MR (Kh-25) AS-20 (Kh-35)	AA-11 (R-73) AA-8 (R-60)
	KA-52K	Yes						

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3   This change has been incorporated into a future Falcon BMS version.

Right now all of the helicopters share the same flight model with the following exceptions:

- "Never exceed" speed

- Internal fuel

- Weapons loadout

Eventually we will hopefully see further differences including:

- Gear details

- Collision details

- Center of Gravity

3   Training Missions

3.1 Overview

The training missions are designed to familiarize a seasoned Falcon BMS pilot with flying helicopters. This manual assumes that the reader is proficient in Falcon BMS, and does not explain basics with regard to the F-16. It is advised to consult the Falcon BMS manuals first if anything is unclear.

The missions are as follows:

1. Helipack Training 01 (Flight): A short flight from one airbase to another. The intent is to teach the pilot the basics of how the helicopter will behave. The goal is to fly from one airbase to another without crashing.

Figure 4: A Russian KA-52 with its signature main rotors. This mean helicopter can shred ground troops with ease.

2. Helipack Training 02 (KOTAR): A visit to the Training Range. The intent is to teach the pilot how to operate the weapons.

3. Helipack Training 03 (NOE): You must fly under the enemy radar. One mistake, and you could be eating bullets.

4. Helipack Training 04 (Naval): Operate a KA-52K from the Kuznetsov.

3.2 Helipack Training 01 (Flight)

Goal: To take off, navigate, and land safely.

Prior to Loading into Falcon BMS: It is optional, but you should consider binding the VTOL Increase Angle and VTOL Decrease Angle buttons. The default keyboard commands for these callbacks are Shift + Period and Shift + Comma respectively.

When in 2D: Slot into Rescue 1-1. Perform the "click dance," ensuring you have your comms ladder properly saved into your DTC. There's not much else to do here. You're good to commit. Select Ramp or Taxi start.

When in 3D: If you selected Ramp Start, begin by performing you ramp start as you would if you were in the F-16. This should be entirely familiar to you.

When your jet is ready to Taxi, you have the option of following ATC or not. Let's try our best to follow the rules for now. Go ahead and ask Ground for taxi clearance. When you're cleared to taxi, begin taxiing very slowly to the runway. The brakes are very loose and do not work properly as of yet. Be very careful. Continue the normal process of getting clearance from Ground. Switch to Tower when cleared.

After you've been passed on to Tower, request takeoff. Taxi onto the runway when prompted, being very careful not to slide off the runway. When you're parked on the runway, go ahead and move the VTOL position to 90°. You should see confirmation you're doing it correctly if the display in the upper right hand corner increases in angle from 0 to 90 by increments of 10 for every button press. Turn your Alt. Radar to Baro now.

Takeoff: When you're ready to take off, increase the throttle gently and aim for an altitude of 500ft AGL. The throttle acts as the helicopter's collective – at least in some sense. More throttle means more lift. Less throttle means less lift. If you leave the throttle too low for too long, the helicopter will suddenly plummet. Unfortunately, once you begin free-falling, you must overcome your descent quickly. These helicopters can drop like rocks if you're not focused.

Pay careful attention to your FPM. The FPM is going to be your information lifeline to tell you where you are headed in 3D space. If the FPM is above the Artificial Horizon line, you're set to climb. If the FPM is below the line, you're falling. If you can't see the FPM, this could be a very bad sign that it has dropped far underneath you (or you're not looking straight in relation to your motion). Never let the FPM dip too low.
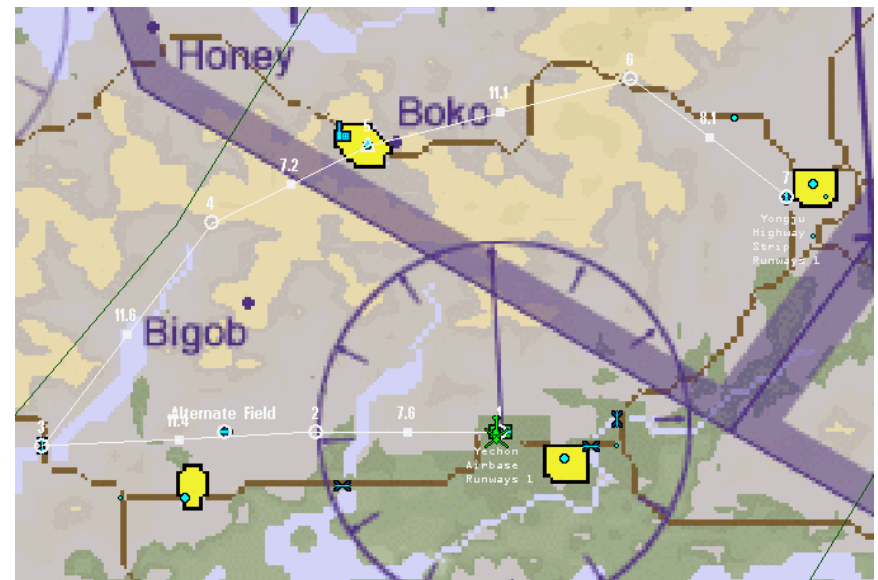

Figure 5: The flight plan. It's not so bad, is it?

Once you're at 500ft, retract the landing gear. Although the gear doesn't actually move on the AH-64 3D model, it's still necessary for the avionics. Betty may begin complaining that you're not in a proper Takeoff/Landing config once the gear comes up. Ignore her. If she bothers you too much, you can mute her with the Voice Inhibit switch on the right-hand of your seat.

Tell Departure that you are airborne, and then switch to Tactical. You're now ready to fly, but let's get some practice in first. We'll try to work on controlling your altitude for now.

Hovering: Try to hold the helicopter at 500ft for a bit. When you're satisfied you can hold it, drop to 400 ft slowly. Maintain that altitude for 10 seconds. When you've managed that, try to increase your altitude to 500ft again. Get used to moving the throttle around and recovering lost altitude. It can be a bit difficult to maintain control while under fire. Now is a perfect time to get used to it. Switch to an arbitrary altitude, and try to hold the helicopter in a hover. See how the helicopter performs at different altitudes just hovering.

Basic movement: When you're ready to begin your journey, select STPT 2. Use your rudder to rotate the helicopter until you face STPT 2. You'll be using a lot of rudder when flying at a hover, so it's a good idea to have rudder controls accessible. Pitch the helicopter down slightly. If the altitude drops, you can raise the throttle. Maintain a balance so that you don't trade too much altitude for forward momentum. Eventually you should begin moving forward.

Feel free to experiment. Stabilize the helicopter back into a hover, and experiment with rolling slightly over to the side. Use the rudder to swing the helicopter around to face the direction you are traveling in. Try to bring the helicopter back into a hover by countering the motions. Don't forget to maintain your altitude as you are doing this.

When you're attempting to hover or move from a hover, you should keep an eye on your alpha. Alpha may be more useful in an F-16, but we need to use the tools at our disposal. When you get used to relating alpha to your movement, it should provide you with some context clues about what is happening in 3D space. Your alpha, although based on relative pitch, may provide you with some context clues as to whether you are stationary, traveling forward, or traveling backwards. If you are hovering and suddenly find yourself moving backwards, you'll notice that your alpha will begin to show different values than if you were drifting forward. Expect the helicopter to fly differently when traveling backwards.

Navigating: When you're ready to proceed, focus again on STPT 2. Begin moving forward at a comfortable rate to STPT 2. As you fly, continue to keep an eye on your FPM. This will now indicate where you're traveling, and whether or not you can clear a hill in front of you. If the FPM is struggling to get above the mountain, even with increasing the throttle, this won't work without additional input. Pitch up to compensate and gain more altitude. You'll slow down a bit, but at least you won't become a pancake.

Your Never Exceed speed is 197kts. Do NOT exceed this speed, or you may damage the helicopter. Black smoke will begin pouring out from the back of the helicopter, and flames will shoot out of the back of your seat. It's easy to miss this damage if you're not paying attention, so keep an eye on your HUD.

Figure 6: Crossing STPT 3 which is located at this bridge.

Follow the flight plan, and try to stay under 300 AGL. Just beyond STPT 2 is your alternate airfield at STPT 8. If something went wrong, you can try landing there. Otherwise, continue onward to STPT 3. You'll see STPT 3 is located at a bridge. Fly past the bridge and turn right toward STPT 4. You'll need to use a combination of roll and rudder to make the turn if you're traveling near the high end of your maximum

speed. It's easy to "wipe out "by applying too much of the wrong input. Turn slowly and get a feel for what the helicopter is doing. If it feels like it's going to roll over too hard, compensate by easing your turn. You might need to increase the throttle as well.

Continue to follow the flight plan, and enjoy the scenery. At STPT 4, you'll have some mountains to cross. Maintain focus on your FPM as you approach the mountains. Look around you, and see how the hills and mountains look from your position. Look up above and see if you can spot the contrails of the AWACS above you. He is most likely somewhere to your left. This is actually easier to spot aircraft from the deck than you might imagine. Take advantage of it when you can.

STPT 5 is located just over these hills at a city. Fly through the city at very low altitude, but be careful not to hit any buildings. This should give you a sense of speed and perspective.

Approach and Landing: When you are getting close to your destination, switch to the Approach frequency. Remember, your landing destination is at a different airbase. Go up the comms ladder to UHF 7 (as opposed to going back down to UHF 4). Request an unrestricted landing. Continue the procedure as if you were in an F-16 coming in for a basic, straight-in approach.

Approach should pass you to Tower. Because we want to follow the ATC rules today, you'll be landing on the runway. This should be easy if you can maintain control of the helicopter at all times.

Figure 7: Flying through the city at low altitude. Buildings can be intimidating. Watch yourself.

The suggestion for today is to try a very slow landing. When you've got the hang of flying, you can come in faster. When you are on final approach, aim for 100ft, and decrease your speed to 60kts. You can do this by lowering your throttle and pitching up slightly. You'll need to balance the pitch and throttle to achieve the desired altitude and speed. If the speed on your HUD reads 0 kts, then you're actually slower than 60kts. You can see your ground speed by switching to the INS page on the DED.

It's important to note that if you slow down too much, you'll begin flying backwards. As mentioned previously, the helicopter will handle differently. While it's possible to fly backwards, you may initially find it very difficult to maintain stability in this state.

Now that you're slow and ready to land, lower your landing gear. Ensure you have three green lights as you would in a normal landing in the F-16. You'll want to be in a near-hover over the threshold of the runway with some small, forward momentum when you cross it. Your speed and the FPM should be your focus at this point. The latter will give you an idea of where you're aiming to touch down.

Now put the helicopter down slowly and gently. You may bounce. ATC may even consider this a non-landing and revoke your clearance. This is OK. Just put it down as gently as possible, and drop the throttle upon initial contact with the ground. Hold the wheel brakes until you come to a complete stop. Set the VTOL exhaust angle to 0°.

Request Taxi back to hanger, and once cleared, taxi slowly and safely off of the runway. Park it at one of the parking places marked BAY 1, and shut the helicopter down. The procedure for shutting down is the same as if you were in an F-16.

Figure 8: We're parked after landing. Whew. Stressful, right?

If you managed to land without damaging the helicopter, congratulations. You deserve it.

3.3   Helipack Training 02 (KOTAR)

Coming soon!

3.4   Helipack Training 03 (NOE)

Coming soon!

3.5   Helipack Training 04 (Naval)

Coming soon!

3.6 Helipack Training 05 (Night Ops)

Coming soon!

4   Tactical Engagements

Coming soooooooooon!

5   Campaigns

Unfortunately, campaigns can be a bit complex. As such, we've released this version of the theater without any campaigns.

If you're well versed with Mission Commander, you may edit a campaign save file with a new squadron of helicopters.

6   Strategy, Tactics, and Limitations

6.1   Role

Figure 9: A prowling AH-64D uses the TGP to capture a SAM radar and some soldiers with anti-air weapons. The tables have been turned.

The helicopters that are flyable are well-suited for taking out ground targets quickly. With 16 AGM missiles on the AH-64, this can be a strong asset to deal with the ground war. When traveling with multiple humans, the force multiplier becomes significant as it will be possible to wipe out battalions quickly and efficiently. Sometimes battalions replenish lost vehicles at an alarming rate, requiring you to wipe them out in one attack. This is certainly possible with a full flight of helicopters.

Another possible role for the helicopters is to provide FAC services, guiding other aircraft to drop their bombs on designated targets. This will require some significant coordination.

6.2   Systems

6.2.1 FCR

For the helicopters that have it, the FCR is going to help you maintain Situational Awareness when traveling in enemy territory. Be very careful when traveling around cities and bridges. Manpads, AAA, and SAMs all await for you. The FCR is your way of obtaining advanced information.

If you lack an FCR, you must be vigilant. Look around you. Noticing the smoke from a launched SAM might save you.

6.2.2 TGP

The TGP is how you're going to spot units on the ground. The IR mode is particularly effective at picking out units on the ground, whether vehicles or soldiers on the battlefield. You'll need to be careful to scan wide swaths of land. Just when you think you've wiped out a battalion, a manpad might be hiding among the trees ready to fire at you.

Don't forget to use the FCR first. The FCR may point you to where an enemy battalion is; the TGP helps you find and prosecute the actual units.

6.2.3 Data Link

Pilots should take care to plan their mission effectively. For static targets, it is possible that multiple helicopters can have their targets already assigned, allowing each pilot to arrive at the target and begin processing targets immediately.

For moving ground targets, the pilots must coordinate with each other not to shoot at the same targets. Using the data link and having an SOP for target sorting would most likely be the prudent course of action.

6.2.4 Laser

Pilots should use the lasers on their TGPs for pointing out moving targets. In future versions, some weapons on the helicopters may be laser guided.

Buddy lasing for aircraft, such as for F-16s dropping LGBs, might also be a viable tactic.

6.2.5 Radio

Due to the need for terrain masking, it is likely that you will lose radio contact with your human wingman/teammate as one of you ducks behind a hill. The general rule is that if a visual line-of-sight is maintained, your radio is working.

Beyond that, you will have difficulty in maintaining radio contact with a package. It is best to fly package missions with a human GCI who is able and willing to relay messages between the helicopters and the rest of the package.

6.3   Buddy System

If you're flying with a wingman, it might be wise to space the flight out. Depending on the terrain and situation, it may be advisable to have one helicopter fly in front, and another in trail. If the trailing helicopter notices a SAM launch on the leading helicopter, he can call it on the radio while using VIS mode to obtain a lock on the SAM in question.

7 Weapons

The weapons are divided into the following categories:

1. Guns

2. Rockets

3. AG Missiles

4. AA Missiles

The bread and butter of any ground attack at present will be the Missiles. This is due to current engine and theater limitations.

Figure 10: An earlier version of Helipack. This helicopter fired all of its rockets in one salvo. Currently this is fixed so that the pilot can fire them in single or pair.

7.1 Guns

The guns behave just like the F-16 cannon. The gun cannot be slewed like it can in some real helicopters, which is an unfortunate travesty. The gun can be selected and deselected by a long press of Cursor Enable when in AG Master Mode. Of note, you can use your TGP to see where the gun sights are pointed.

In order to slew the gun, official developer support will most likely be needed.

7.2 Rockets

Rockets have been improved in this theater. The rocket pod will not release all of its rockets when a launch is requested by the pilot, but will fire in either single or else pair depending on what the pilot has selected.

Unfortunately, all rockets are fire-and-forget with absolutely no guidance. This makes them less than ideal for taking out moving targets. They can be used for taking out large static objects, like buildings.

7.3 AG Missiles

The missiles are considered internally by Falcon BMS to be Mavericks. Essentially, each helicopter is carrying AGM-65s that have some strange quirks.

1. Boresighting works and is recommended, however, each missile will never auto-lock when given a target via handoff. Each missile must be manually assigned a target via the WPN page.

2. When the missile hardpoints are cycled, the previously selected missile will lose its lock. Always confirm that you have the option to boresight the selected missile before you fire. This means you have a lock.

7.4 AA Missiles

These missiles behave like the AIM-9. They are heat seeking missiles.

8   References

- Github: https://github.com/BibleClinger/HeliPack

- Trello: https://trello.com/b/C5C9tWjD/helipack

- Falcon Lounge Discord[4]: https://discord.com/invite/KQNHQBz

Figure 11: An AGM-114 is about to strike a tank.

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4   The Falcon Lounge is a regular hangout for Falcon BMS pilots. It's not dedicated to this project.