BMS NAVAL OPS

Version: BMS 4.35

CHANGE 2.00

12. 2020

FOREWORD

PURPOSE AND SCOPE

This manual contains information on BMS Aircraft Carrier Operations. BMS implements naval operations featuring the F-18 Hornet as primary aircraft, although the AV-8B Harrier and the F-14 and Su-33 are also flyable. The 4.34 release added completely new Air Traffic Control (ATC) procedures for player-controlled aircraft and AI. The 4.35 release added another carrier group centred on the LHD-1 WASP.

This document is a standalone from other BMS manuals which are dedicated to the F-16. Please reference the full suite of BMS manuals on TE Creation, Communication, and Navigation, as these functions are common to both land based and carrier based operations.

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LIST OF EFFECTIVE CHANGES

Change 2.00: 4.35 release with addition of WASP, Harriers and training mission 26. Published Nov 2020.
Change 1.01: Lulu release with more content added published April 2019.
Change 1.00: Initial release of this document published March 2019 for 4.34

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2. Introduction

Although BMS is still a F-16 sim, Carrier operations have been judged an important asset in TE and campaign, to make carrier operations more relevant for the players, some aircraft have been further developed to become playable in the carrier operation environment.

The F/A-18C, the AV-8B and the Su-33 are at different level of integration into BMS carrier operations.

The F/A-18 is by far the most complete aircraft for carrier ops in BMS. It features a fully dedicated 3D model and cockpit with relevant carrier functions enabled.
The Harrier is equally well developed and features, on top of the 3D model and fully dedicated cockpit, the VSTOL flight model and therefore the capability to take off and land vertically.
The Su-33 and its Chinese License built version (J-15) is the last born of the family. At time of 4.34 release, only the new 3D model was completed, and the cockpit is still a F-16 cockpit. Let's hope a dedicated cockpit is developed soon.

Beside aircraft updates, BMS 4.34 introduced improved modeling of carrier including:

- Ship movement with waves
- 4 active steam catapults for US carriers
- Ski jumps for Russian and Chinese carriers
- Improved AI behavior on the deck
- Accurate deck geometry
- Arrestor cables modeling
- Case 1 & Case 3 recovery procedures with ATC
- Landing Signal Officer (LSO) communications

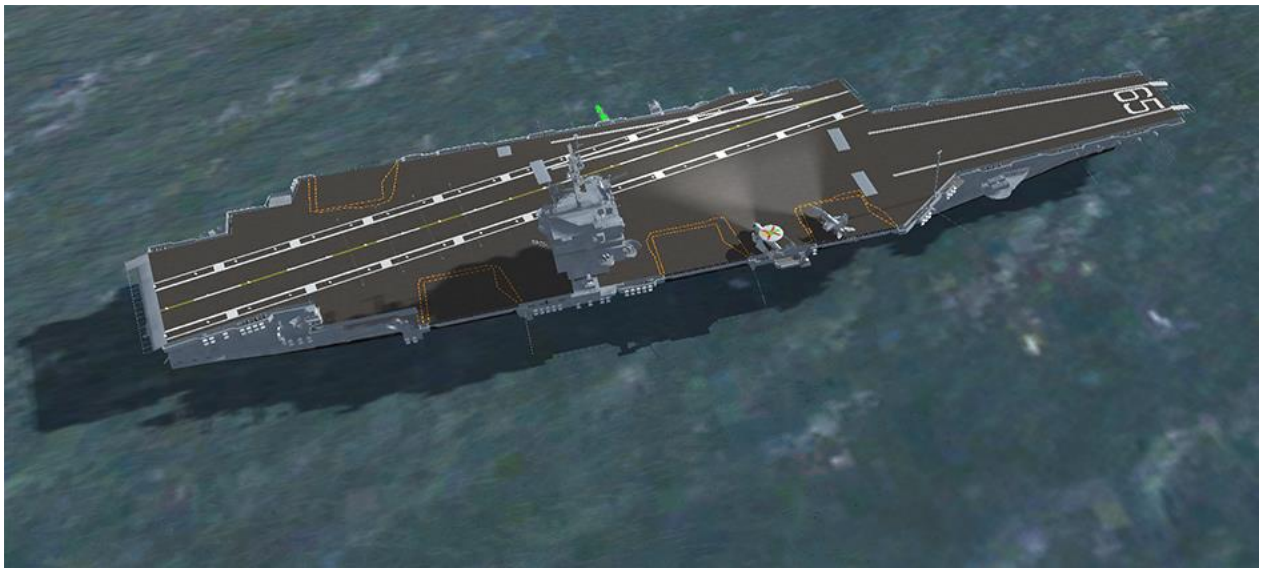
Carrier operations is still a work in progress but missions can now be executed from the deck of carriers with shipborne aircraft where launch and recovery procedures are quite exciting and very well supported by ATC.

3. Carriers

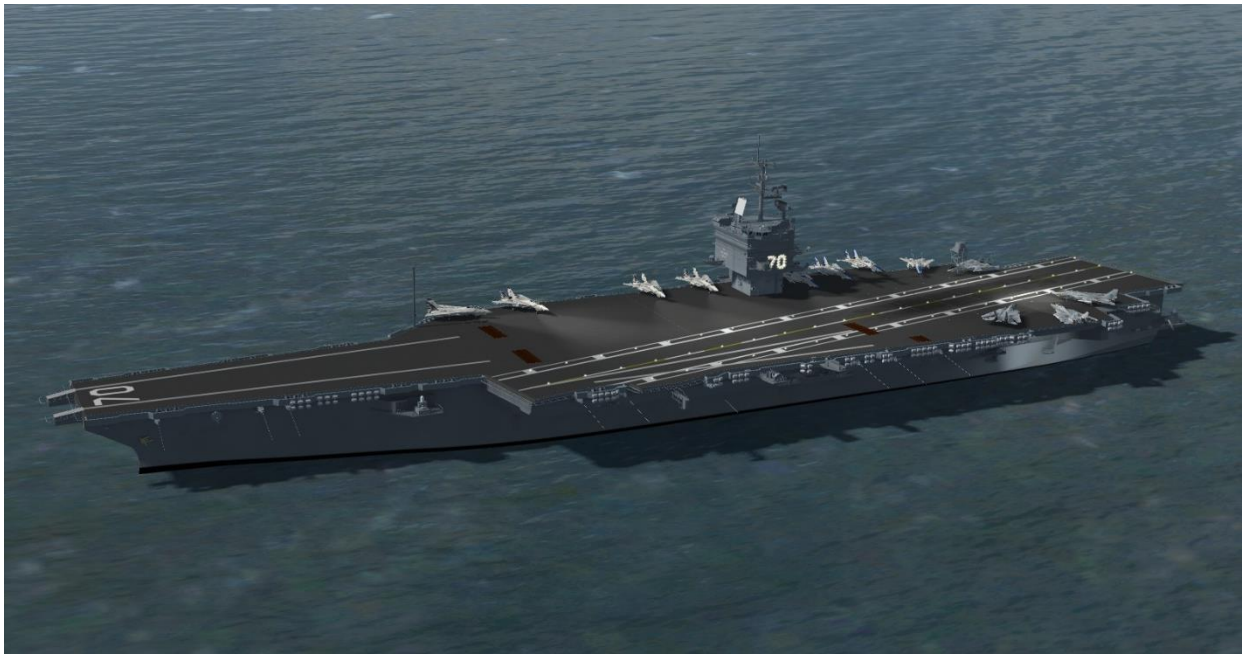
BMS features a total of 6 carriers:

- 3 US Super Carriers

CVN65 USS Enterprise



CVN70 USS Vinson



CVN 71 USS Theodore Roosevelt

- 1 US Landing ship:

  LHD-1 USS WASP

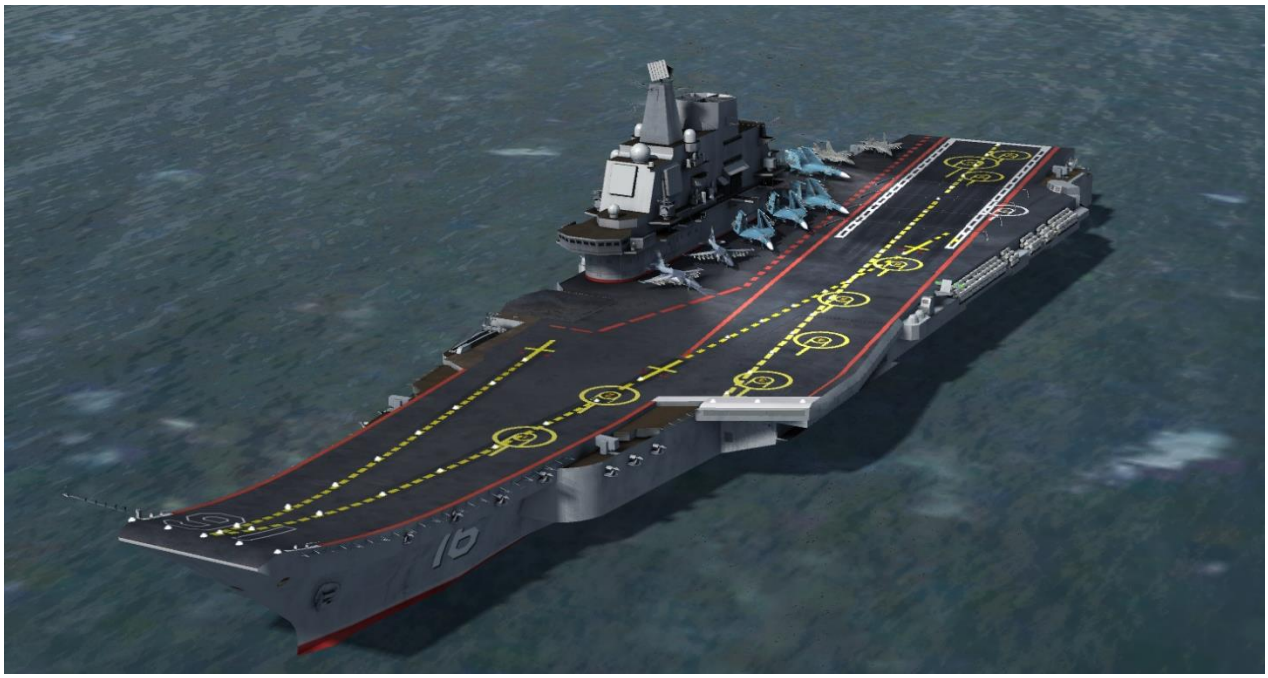
Obviously, the USS WASP is not a carrier but should accommodate only V/STOL aircraft and helicopters.

- 1 Russian Carrier

  TAKR Kuznetsov

- 1 Chinese carrier (Liaoning).

  The Chinese carrier is the ex Varyag a sister ship of the Kuznetsov.



In addition to an enhanced 3D model, each vessel has expanded COMM/NAV frequencies supporting naval operations: TACAN, ILS, Approach control, Tower/LSO and Deck movement (GROUND) radio frequencies.

The easiest way to find the correct radio frequencies is to use the UI DTC page or the briefing page.
For reference the carriers have the following radio channel assignments:

CARRIER	TCN	ILS	APPROACH	TOWER/LSO	GROUND
# VINSON (CVN**70**)	010X	111.7	2**70**100	270200	270300
# ROOSEVELT (CVN**71**)	011X	110.1	2**71**100	271200	271300
# ENTERPRISE (CVN**65**)	012X	108.55	2**65**100	265200	265300
# WASP	015X	112.1	268100	268200	268300
# KUZNETSOV	013X	111.1	363100	363200	363300
# LIAONING (CV16)	014X	108.3	272100	272200	272300

I am sure you notice the mnemotechnic way to remember these frequencies! They are sequenced through their logical use for recovery. 1 approach, 2 Tower/LSO (Landing Signal Officer), 3 Ground and the frequency in the 2xx range corresponds to the carrier ID CVN 65 is 265.
Unfortunately the US LHD and red forces carriers don't follow the same logic.

4. Planning Naval Operations

Adding and managing aircraft carriers and their air squadrons to a tactical engagement or campaign may be new to many of you, please reference the Tactical Engagement chapter in the BMS Manual for more information. This guide will help you enhance your mission with naval assets.

4.1 Step 1: Add Task Force

In the TE Builder and TE Editor, there is an icon that allows adding naval units. 
Then pick a carrier from the list.

Decide which team or side will own the ship and its aircraft, click the flag icon, then the ship symbol. You can then pick a carrier group from the list.

Never place the carriers too close to shore, they might stop their patrol to avoid running aground. Ensure they are at least 30 Nm from offshore.

To ensure proper ATC operation, do not add the same carrier twice in a mission.

4.2 Step 2: Add Squadron

Click on the Add Squadron icon then click on a carrier icon or an airbase on the map. The ADD SQUADRON window will appear. Notice that your task force is listed in the AIR BASE selection.

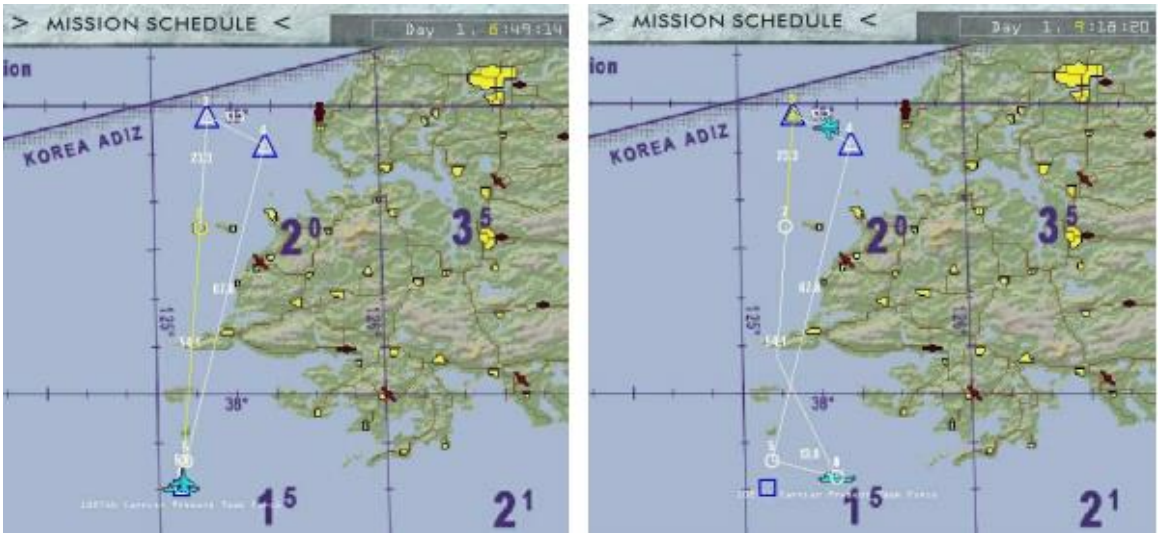
Choose your aircraft type and the task force as an airbase. You can also use the Add Flight or Add Package button; the task force will be listed in the AIR BASE list.

Basically, as soon as the task force is created everything acts as if the carrier was a regular land airbase.

If you want to remove the carrier, be sure to first delete any flights based on it in the ATO, then to delete the squadrons, then you can safely delete the carrier task force.

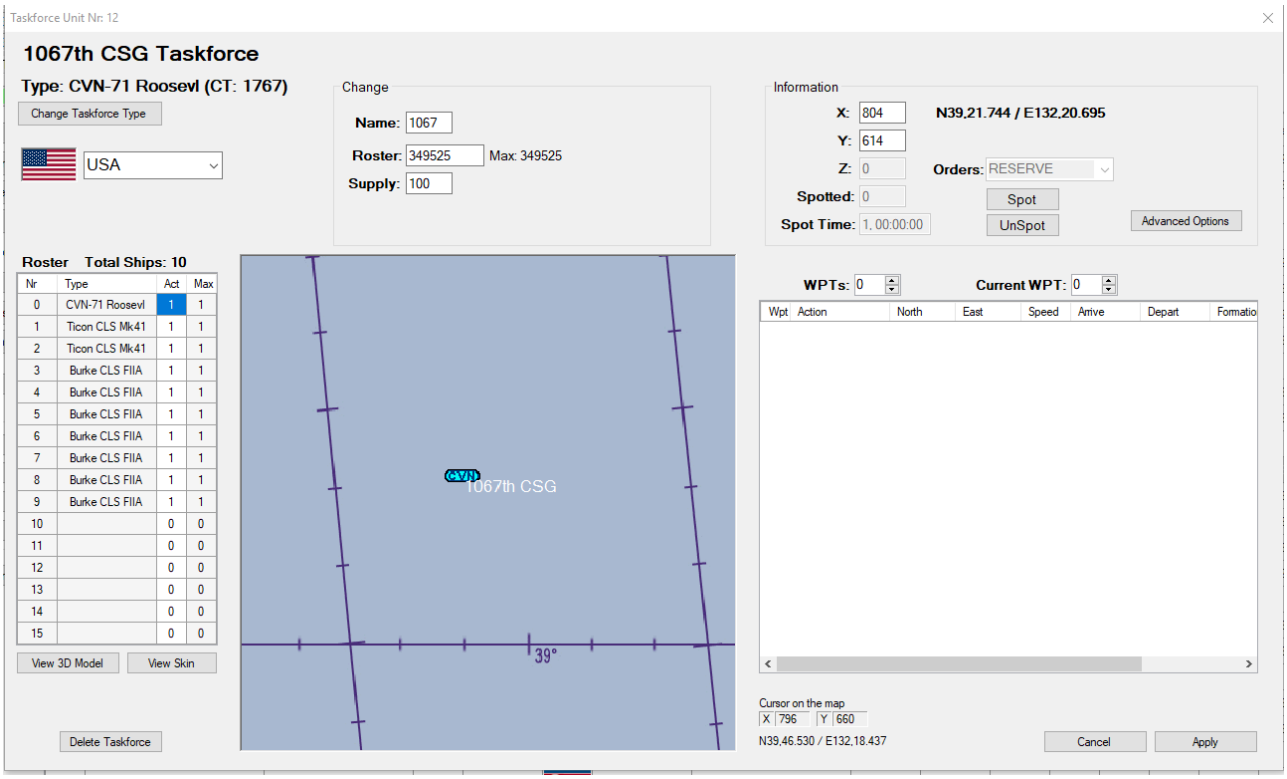
4.3 Flight plans

By default the carrier follows a predetermined square pattern. This can be changed to a custom pattern via Mission Commander.
During a mission the flight plan is automatically updated so that the landing waypoint always corresponds to the carrier's actual position. This is observable both in the UI and in-flight.



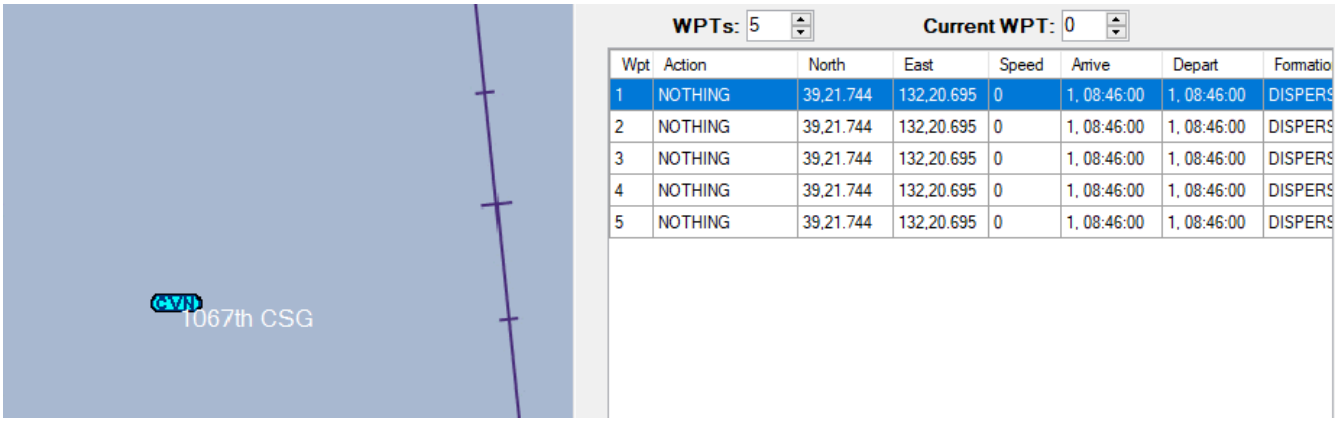
Assigning a specific route to a carrier can be done in Mission commander:

Once you have opened your TE with the latest version of MC, go to the Units tab and double click the CVN task force from the list:



The task force does not have any steerpoint assigned. The WPTs box and Current WPT box are both set to zero.

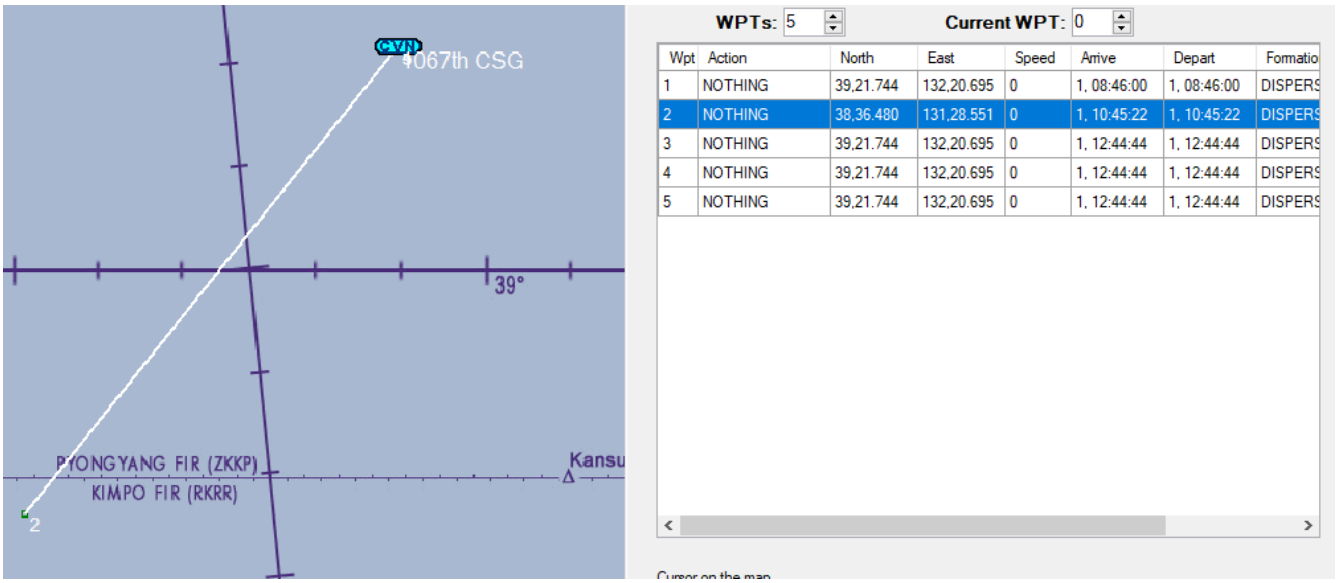
To create a route you must add waypoints. This is done by clicking the UP arrow located on the right of the WPTs box. Create as many steerpoints as you need.



Wpt	Action	North	East	Speed	Arrive	Depart	Formatio
1	NOTHING	39,21.744	132,20.695	0	1, 08:46:00	1, 08:46:00	DISPERS
2	NOTHING	39,21.744	132,20.695	0	1, 08:46:00	1, 08:46:00	DISPERS
3	NOTHING	39,21.744	132,20.695	0	1, 08:46:00	1, 08:46:00	DISPERS
4	NOTHING	39,21.744	132,20.695	0	1, 08:46:00	1, 08:46:00	DISPERS
5	NOTHING	39,21.744	132,20.695	0	1, 08:46:00	1, 08:46:00	DISPERS

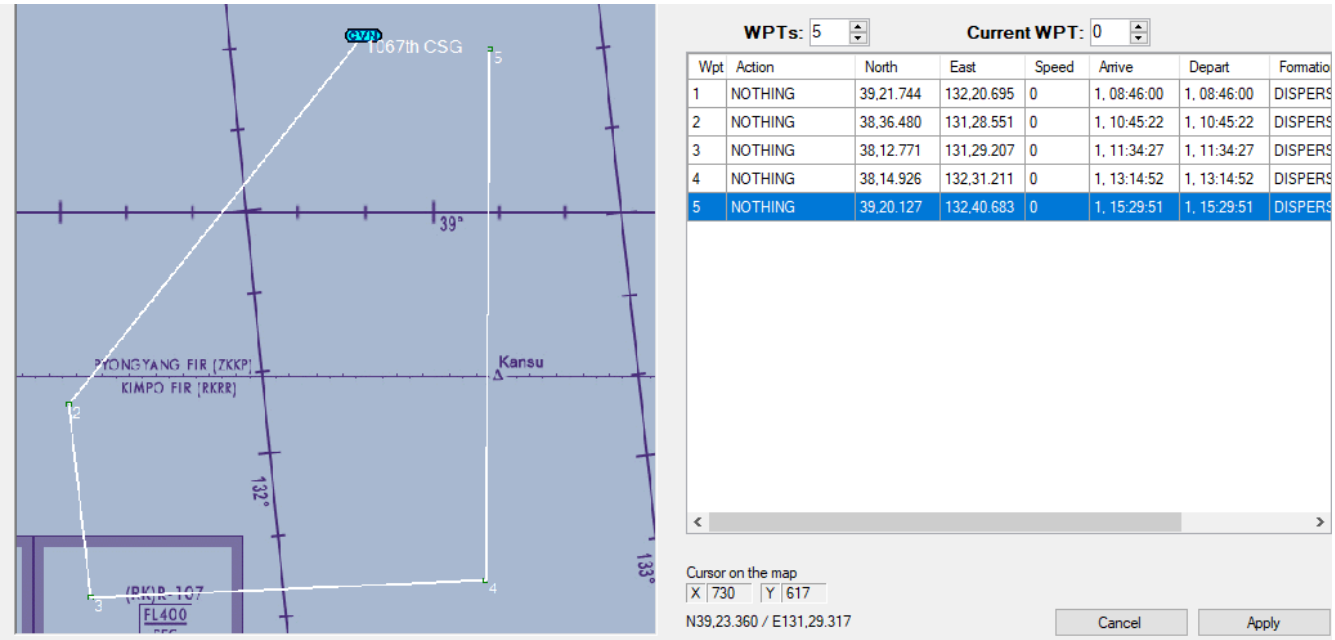
In this example we created 5 different steerpoints. But notice that the map remains void of any route. The waypoints have all been created at the same location as the initial position of the task force.

To change the waypoint location, select first the waypoint you want to change.
Waypoint 1 is the initial position of the taskforce so if you move it the taskforce icon will move on the map. This is not what we are trying to achieve, so select waypoint 2 by clicking on the second line (it turns blue). Once you have the right waypoint selected, right click on the map at the position where you want the steerpoint.
A white circle will appear on the map at the location you selected and a white line will be traced for the route of the taskforce.

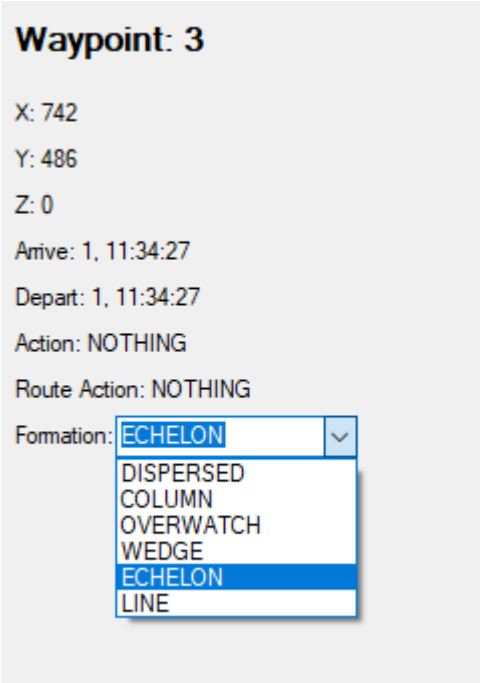


Wpt	Action	North	East	Speed	Arrive	Depart	Formatio
1	NOTHING	39,21.744	132,20.695	0	1, 08:46:00	1, 08:46:00	DISPERS
2	NOTHING	38,36.480	131,28.551	0	1, 10:45:22	1, 10:45:22	DISPERS
3	NOTHING	39,21.744	132,20.695	0	1, 12:44:44	1, 12:44:44	DISPERS
4	NOTHING	39,21.744	132,20.695	0	1, 12:44:44	1, 12:44:44	DISPERS
5	NOTHING	39,21.744	132,20.695	0	1, 12:44:44	1, 12:44:44	DISPERS

Repeat the sequence for all steerpoints in the list you created and you can therefore assign a specific patrol area or complete route for the whole taskforce.

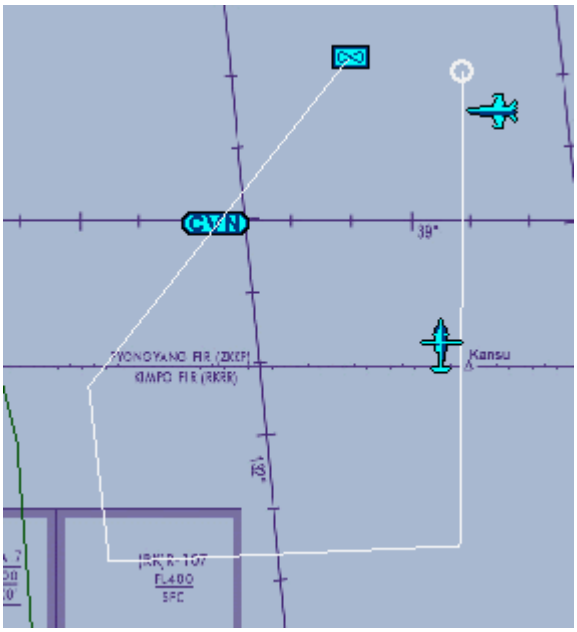


The only variable you may change for each waypoint is the formation of the task force. If you want to change it, just double click on the waypoint line and use the drop down menu to modify the formation and click apply when done.



Once the route has been completely created click the apply button and do not forget to save the TE before closing Mission Commander.

Now if you click on the carrier group in the TE editor you will see the new route of the task force on the UI map.



As you can see from the picture above, the carrier is on its way from its initial position to its steerpoint 2.
The aircraft in flight should find the carrier back at the end of their flight plan.

Remember do not place the carrier too close to shores, as they will by default sail in a square pattern that you cannot see, they may run the risk of running aground.

5. Aircraft Operations

Dedicated shipborne AI aircraft are able to perform launches (catapult or ski jump) and all implemented recovery types (case1 and case3) including bolter and wave-off.

- A bolter is when the hook does not connect with an arresting wire and the aircraft launches again after having touched the deck.
- A wave-off is a directive call from the LSO to abort the landing and go around.

Helicopters are also able to operate from carriers and landing ship.

Unlike previous version of BMS the carriers continue to sail in both solo and multiplayer.
When launching or recovering aircraft the carrier will always turn into the wind.

5.1 Deck Operations

Selecting the TAKEOFF option is no longer possible for a carrier departure; only RAMP or TAXI options are available.
TAXI starts at on the deck at the parking spot with the jet ready to go.
RAMP starts in the same position but with a cold jet. The pilot will have to go through the full start-up sequence.

All four catapults can be used on a USN carrier.
On the Russian and Chinese carriers, only 3 launch pads are available. 2 on the bow and a single one on the waist.
However, in both cases AI aircraft will only use the two forward catapults.
Lead and Element lead are supposed to take the forward port (left, after all this is a naval document) catapult and their respective wingman the starboard catapult.

Although the chocks are still referenced in the ATC messages, in naval operations they are visible as chains. Obviously, they need to be removed as usual before the aircraft is taxied forward.

When ready to taxi request ATC clearance for departure. This is done as usual on the ground frequency through the ATC menu, Ground page.
The carrier will always turn into the wind during aircraft operations, this may create havoc in the task force formation but it is none of your concern as an aircraft pilot.

Carrier aircraft taxi out with their wings folded (if featured) obviously pilots will have to deploy the wings before launch. This is done with the AFWingFoldToggle callbacks assigned by default to *SHF w* (on US qwerty keyboards)

ATC will instruct you to hold short.

Take position behind the Jet Blast Deflectors and do not “foul the deck” by blocking other taxi operations.
At some point the deck controller will switch you to tower frequency and you will be cleared to take position on the catapult.

The taxi procedure is the same on Russian and Chinese carriers.

Refer to chapter 5.2.3 for LHD taxi operations.

5.2 Launching procedures

5.2.1 Catapult operation (US Carrier)

Before getting into launch position, check that your aircraft is ready: (if equipped):

- Launch bar is in down position (*SHF CTL ALT L - please note, that's the toggle*)
- Wings are unfolded (*SHF w* (toggle))
- Take off trim is set (*SHF CTL ALT t* – for the hornet)

After clearance from the Tower has been granted, carefully align with the catapult and move slowly into position.
Move forward until your canopy is approximately aligned with the pole on your starboard side. (see picture below)

When you connect with the shuttle, it will stop the forward movement of your craft. The Jet Blast Deflector behind you will rise up.

Note the AI positioning behind the JBD, awaiting their turn.

Unlike real life, you must now release the launch bar from the catapult shuttle. It will stay connected as it's Mechanically locked to the shuttle.

Do not forget to raise your launch bar once attached to the catapult. Failure to do so will prevent the nose gear from fully retracting after takeoff as the launch bar will remain in the down position preventing nose gear retraction

When ready to launch and take off granted by the TOWER, go MIL power or afterburner (if available). As soon as your thrust is established the catapult chief allows steam pressure to build up in the catapult. Your aircraft will launch when pressure is sufficient.

Be aware that you do not control or trigger the exact launch time, nor will you have a warning. You will receive a message confirming to prepare for launch though

The aircraft will not be launched if any of the following condition exists:

- Wings are folded
- Carrier is not headwind
- The deck is pitching down
- The engines are not at full power

If for some reason you need to unlock from the catapult you can do so by using the callback AFTriggerCatapult 'CKPIT: NAVOPS - Release Catapult Trigger', assigned by default to *SHF K*

Note: This callback does not trigger the catapult launch anymore, it is completely automatic.

As with a real catapult, the steam pressure is adjusted to your weight, so that you will always have enough airspeed after the launch. It is recommended to keep afterburner on until you reach at least 250 – 300 kts.

5.2.2 Ski Jump operation (Chinese & Russian carriers)

The Russian and Chinese carriers do not have steam catapults but a ski jump deck.

The Russian naval aircraft are launched from the raw power of their engines. Wheel blocks are keeping the aircraft in place while they are at full power. Once they retract in the deck surface, the aircraft are launched.

Once clearance has been obtained from tower spread the wings (for Su-33 – the Mig-29 model although navalised doesn't support wing fold) and taxi forward past the jet blast deflector aligned with the yellow launch line painted on the deck.
Once past the Jet Blast Deflector, two large red wheel blocks will raise from the deck just in front of the main gear wheels stopping the aircraft. Check your controls and perform your final checks and once ready, spool up the engine and put MIL or AB (if equipped).
As with the US carriers, launch will be automatic from this point.

The aircraft will not be launched if any of the following condition exists:

- Wings are folded
- Carrier is not headwind
- The deck is pitching down
- The engines are not at full power

If for some reason you need to unlock from the blockers you can do so by using the callback AFTriggerCatapult 'CKPIT: NAVOPS - Release Catapult Trigger', assigned by default to default to *SHF K*

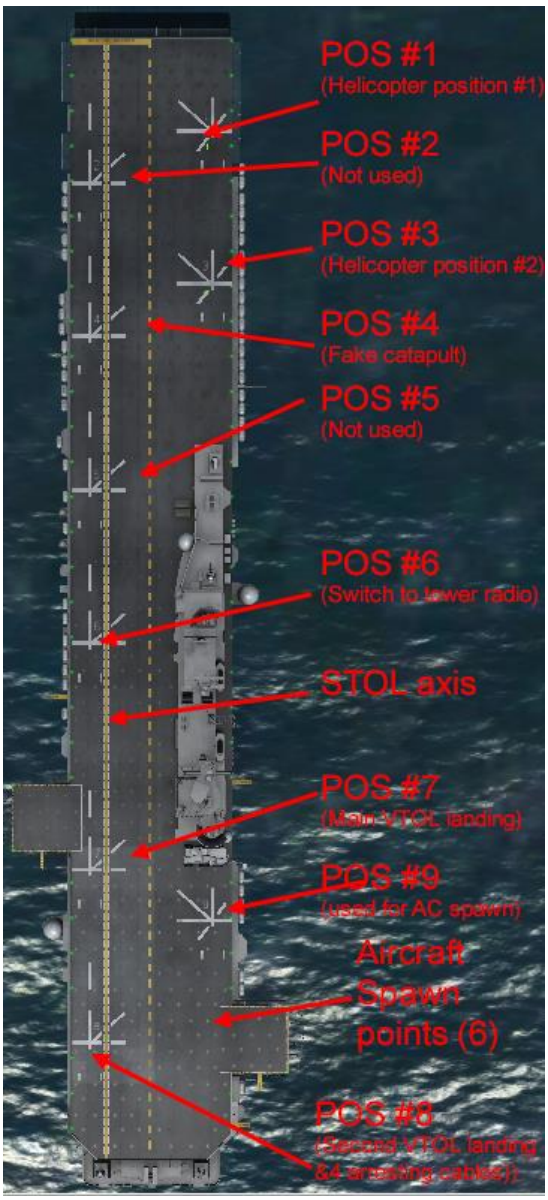
Note: This callback does not trigger the catapult launch anymore, it is completely automatic.

5.2.3 LHD operation

Unlike larger Supercarriers the Landing Helicopter Dock (LHD) does not feature an angled deck and are not meant to launch conventional take-off fighters. These ships are meant to support Marine amphibious assault with their own Marine Air Group made of V/STOL aircraft and assault & troop transport helicopters.

In BMS only the LHD-1 USS Wasp is implemented. Wasp is mainly meant to be used with the Harrier. The AV-8B and AV-8B+ are fully operational from the USS WASP for both AI and human pilots. Compromises have been made for AI to be able to use the ship as the AI are unable to operate in the V/STOL mode. Therefore the WASP has been equipped with launch catapults and 4 arrestor wires. For human pilots flying the Harrier these can be ignored and the Harrier can be launched with a Short take off procedure and landed vertically on the ship according to the gross weight limitations of the aircraft.

The deck is marked with 9 helicopter positions. Only two of them (spot #1 and #3) are actual spawn point for helicopters in BMS. The others are not used by AI but can be used as reference marks for vertical take-off or vertical landing for human piloted Harriers.



The fake catapults are positioned close to Spot #4. The AI Harriers will taxi to this spot and will be launched by the catapult which is almost like a short take off procedure. Except It does not start at the back of the ship as in reality. A consequence to that is that the switch from ground frequency to tower frequency will not be triggered for the human piloted aircraft until they come close to spot #6 which is the ATC hold short point. That is the biggest issue on WASP human deck operation as the short take off procedure would start on position #7 or #8 where the pilot is still on ground and cannot talk to tower for proper clearance.

The problem is that the AV-8B is only able to take-off from position #6 with a very light load (around 23000 Lbs Gross Weight. If heavier, the ATC procedure has to be ignored.

6 aircraft are able to spawn in line behind the ship's island on the rear elevator and position #9.

Position #8 is also where the fake arrestor wires are placed allowing the AI Harriers to land on the WASP with their fake hooks.

launching from the WASP with the Harrier

Engine start will be performed on the parking position behind the island. Once ready to taxi, the jet can be aligned to the large yellow line and the jet can be readied for the short deck take-off.

A real Harrier does not vertical take-off from the LHD. A rolling take-off is performed from the back end of the ship with nozzle set at zero degrees and at a certain position during the take-off roll the nozzles are placed to STO which is a predetermined nozzle angle position depending on gross weight and atmospheric conditions.

In BMS we do not have the STO position of the nozzle preventing such procedures to be executed correctly. Depending on gross weight, the BMS Harrier is able to perform a rolling take off with nozzle set at 50/60° right from the start of the take-off roll.

As mentioned above, the procedure is dependent on aircraft gross weight at time of departure.
I have to make a disclaimer here. Getting the information proved to be impossible. Nobody in the dev team was able to provide any useable information about the limiting values of the gross weight.
So I had to find these values on my own by doing a lot of testing. These values are only valid at the time of testing and with the version I tested. They are provided as indicative value and I perfectly understand you might have different ones or these might change in the code and data of the version released to the public and more probably the following patches for which no manuals will be done.

The results of my testing identified the maximum gross weight for LHD short take-off is 26000 Lbs, starting from as far back as possible with nozzles at 50%. Anything above that (max Gross weight of the AV-8B is 31000 Lbs) will probably end up in the water in front of the ship.
Between 23000 & 26000 Lbs, use a starting position as far back as possible to ensure you have enough speed at the end of the deck.
Below 23000 Lbs, you may start from position #6 and enjoy the proper ATC procedures.
Since the Harrier empty weight is 14000Lbs and internal fuel is 7800 Lbs, a non-armed Harrier totals at 21800 Lbs. So if you want to load weapons, you may consider lowering the internal fuel and plan for aerial refuelling after take-off.

The take-off is performed normally without touching the 50/60° nozzle angles until safely airborne with gear up and the jet accelerating. At that moment transition to horizontal flight can be performed by rotating back the nozzle gradually to zero degree.
Obviously starting the take-off roll with nozzle horizontal will provide more speed but you need to be able to quickly rotate the nozzle to 50/60° at once just before leaving the deck. If you are able to perform this STO STOP simulation with HOTAS programming for instance you may use a heavier gross weight than documented in this chapter.

Bear in mind that as you perform this launching procedure the runway is blocked and AI cannot land as they need the full deck (at least to just past the island) for their compromised cable arrestment procedures.

Vertical recovery on the WASP

AI piloted Harrier will trap on the Wasp just like hornets would trap on the carriers. They will perform conventional deck landing and will be stopped by one of the four fake arrestor wires on the ship.

Although human piloted Harrier can perform the same procedure it is really not what most of us are interested in when flying the Harrier. We want to land on the ship just like the real Marine pilots do. That means transitioning from horizontal flight to hovering just abeam the designated landing spot and then gently translate over the landing spot and land.

Transitioning from horizontal flight to hover:
After your break turn over the ship, start slowing down on downwind and dirty the aircraft: gear down, flaps confirmed down, maintain 600 feet, and fly 210-220 kts. Extend the downwind till 6-7 Nm from the ship then turn base.

Turn on BRC (since the LHD do not have an angled deck, BRC is the ship course) and you should be around 5 Nm from the ship when you start your transition to hover. Set the nozzle to 60° and monitor your deceleration while maintaining an altitude above 500 feet.
At 2 DME, set nozzle to 80°. In BMS we do not have the hover stop position which is determined according to gross weight and atmospheric conditions. but 80° nozzle will provide a nice transition to hovering abeam the landing spot.
With the nozzle at 80° the aircraft should loose forward momentum. Bear in mind that from this moment you control altitude with the throttle and forward or backward movement with the stick and the nozzle rotation angle.
If the Harrier does not slow fast enough you may gently pitch up a bit more and/or rotate the nozzle further back to 90 or even 100°. Do rotate them back to 80° when satisfied with your airspeed.

Once your airspeed decreases under 60 kts you will lose the HUD airspeed scale. from that moment I switch to the LIST-6 (INS) page to have a groundspeed reading and I try to match my groundspeed with the speed of the ship.

During flight operations the ship is sailing at 18-20 kts into the wind so aim to get 15-20 kts groundspeed for your hovering abeam the chosen landing spot.
Primary landing spot is position #7 and secondary landing spot is position #8. Try to avoid the forward landing position and always shoot for the back of the ship landing spots.

The deck of the Wasp is 60 feet high so plan your hover around 150-200 feet MSL. Normally the final hover is made 50 feet above the deck. If you are confident you can use that number but start with a little bit more conservative height above the landing spot.

This hovering is really difficult in BMS. It is probably quite difficult in real life as well I reckon. It is very easy to get out of position and lose visual reference with the ship. You really need to make gentle control inputs and never ever reduce throttle too much. If you do that you will sink and crash. Do not delay hovering but transition over your landing spot gently. Once you are above the deck, gently reduce the throttle while maintaining your visual cues and land on the deck.

When your main wheels touch the deck you may experience a weird roll forward. The aircraft may jump forward on the deck for no obvious reasons. I would call that a bug and that is the reason I do not recommend using the forward landing spot on the Wasp deck. When I tried it usually ended in the water.

Unfortunately the vertical landing procedure on the WASP does not quite suit the ATC approach procedure which will be focused on the conventional arrested landing. So even though you may hear LSO calls he will always ask you to drop your hook and eventually end up waving you off as you are not alongside the conventional landing approach profile.

5.3 Departure procedures (Carriers)

5.3.1 Case 1 departure

Case 1 departure are flown during VMC conditions.
Once the aircraft has cleared the bow and established a positive rate of climb, the pilot will execute a right clearing turn when launched from the forward catapults and a left clearing turn when launched from the waist catapults. (The Ai never go on the waist catapult, so this left clearing turn is only valid for human players).

After the clearing turn, the pilot will climb no higher than to 500 feet and fly a heading parallel to the ship course, maintaining 300 Kts until 7Nm from the carrier tacan. The altitude restriction is obviously to provide separation with possible aircraft in the landing pattern (floor at 600 feet). Be aware that the BMS code does not provide any safety feature for deconfliction for AI in this case.
At that point, the pilot may contact departure and climb VMC on course.

For Russian and Chinese carriers, the departure procedure is the same but all clearing turns are to the right since all aircraft clears the bow and non are launched from the left side of the ship.

5.3.2 Case 3 departure

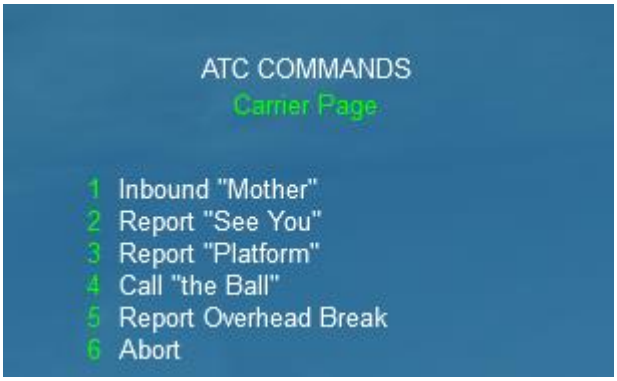
Case 3 departure are flown during IMC conditions.

The BMS code does not plan anything particular for IFR departure from the carrier.
In real life launch control will space departing aircraft further away from one another, but that does not happen (yet) in BMS.
Such departure from the human side at least are flow on the departure frequency with a controlled climb in IMC maintaining 300 kts until reaching 5NM from the carrier at or above 1500 feet. From there the flight takes its departure heading according to its flight plan.

5.4 Recovery procedures (Carriers)

A dedicated ATC for carrier recovery has been introduced in 4.34.

To contact the ATC for recovery, Approach (Marshall) or Tower (Pri-fly), use the dedicated Carrier page of the ATC menu. Do not use the regular Tower or Approach pages.
Please note, there is no separate carrier approach and carrier tower page, they share the same “carrier” page within the usual ATC menu opened with the “*T*” key



Case 1 and Case 3 recoveries are fully implemented.

Case 1 is a visual recovery, much like an overhead at a land base
Case 3 is an instrument recovery, much like an ILS approach with dedicated holding and aircraft separation procedures.

If you wonder about Case 2 in real life, it’s a mixed case when the flights have to go through the weather for descent or part of the holding, but when the final break and landing pattern can be made VFR under the weather. It is not implemented in BMS.

Case 3 recovery is used:

- At night
- If weather condition is POOR or INCLEMENT with clouds below 1000 ft.
- If visibility is below 9 km

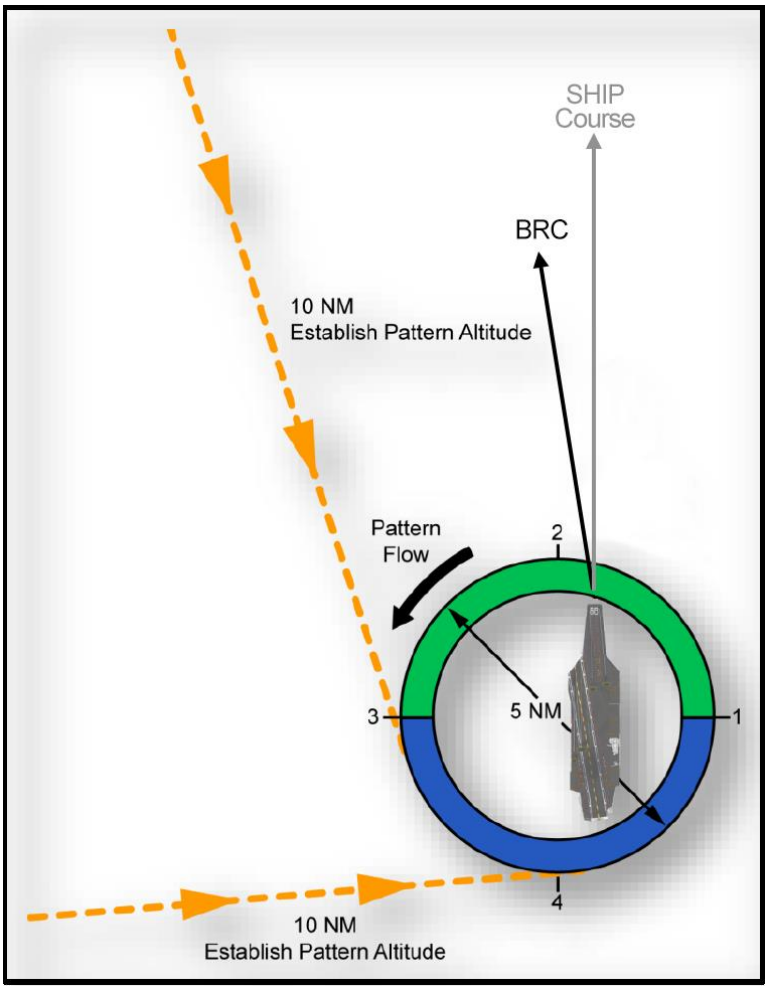
Otherwise Case 1 recovery is automatically in effect.
The initial radio contact with the ATC “Marshall” Controller should occur on the carrier approach frequency, prior to entering the 25 Nm by calling “inbound Mother”.

Marshall will give anticipated Case recovery and any other general information for the recovery such as weather conditions, assigned altitude or BRC.

BRC means Base Recovery Course. This might be a confusing term as in real life it is the course the ship is sailing during launch and recovery procedures. It is NOT the same as the heading the aircraft will fly during final approach as the landing deck is angled 10° to the side.
In BMS BRC is NOT the ship course as it was compromised very early during coding. It is the final approach course an aircraft should fly to recover on the carrier– (hence ship course -10°) therefore BMS carrier procedures differs from real life procedures by 10° which is the angle of the landing deck.
Please note, in the case of LHD landing, since these have no angled deck, BRC equals to ship's course.

5.4.1 Case 1 recovery

After the initial check in with Approach, proceed directly to Mother on the altitude block you received from the carrier ATC.
When in visual contact with Mother notify Marshal with the “Report see you” call of the carrier page of the ATC menu and enter overhead left holding – called the stack - at the instructed altitude.
Aircraft returning for Case 1 recoveries must be established at their respective altitudes before entering the stack. Proceed to overhead holding and enter the pattern tangentially.



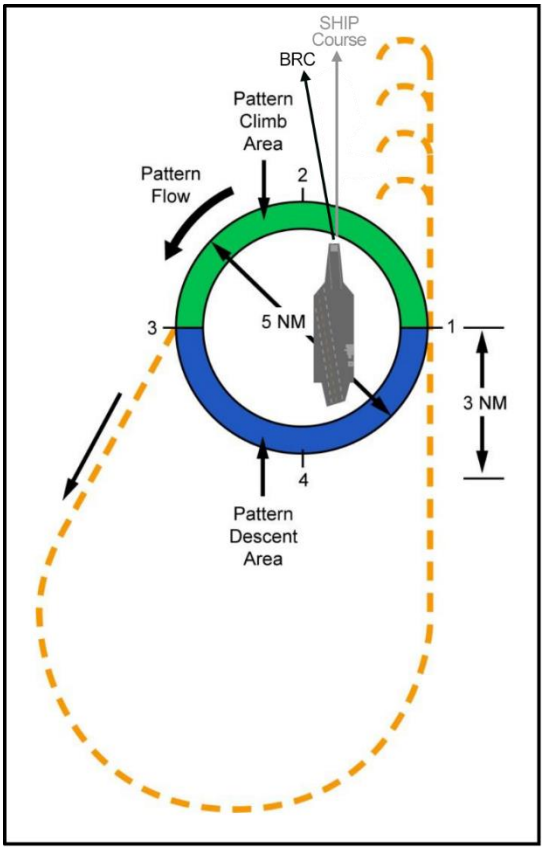
You will be instructed by Marshall to switch on the Tower Frequency before entering the Stack.

Remember BRC is Basic Recovery Course and although it’s the ship course in real life, it is the orientation of the landing deck in BMS There is a 10° off angle between the ship course and the landing deck. If the ship’s heading is 360°, BRC in BMS is 360-10=350°

The case1 recovery is separated in different steps: **the stack** (min 2000 feet), **the pattern** (min 800 feet) and the **landing break** (min 600 feet until calling the ball).

The stack:

The holding is a left-hand pattern, with Point 1 located directly overhead the carrier. Points 2, 3 and 4 sequentially follow in 90-degree increments (Figure right).
This holding pattern is often referred to as the "stack," and all aircraft must remain within 5 NM from the ship and no lower than 2,000 feet MSL. While holding, maintain 300 kts.



Each flight has an assigned holding altitude in the stack, beginning at 2000 feet MSL. These assigned altitudes are separated vertically by a minimum of 1,000 feet and are assigned by the CVW SOP. Once established in holding, any altitude changes within the pattern are accomplished as follows:

- Climbs: Performed between points 1 and 3.
- Descents: Performed between points 3 and 1.

When given a "Signal Charlie" call from Tower, the flight will depart the holding pattern on a heading of approximately 210 degrees relative to BRC.

As altitudes in the stack are vacated, aircraft at the next highest altitude will descend to the next lower vacated altitude without any more instructions. Usually when you are the lower in the stack, the Charlie call will be issued by the carrier tower

The pattern (from leaving the stack till the landing break):

When departing holding, the flight will descend outside of point 3 to 800 feet and proceed to the "initial" 3Nm astern of the ship by performing a large left turn back towards the ship. The flight will then continue inbound and fly just outboard the starboard side of the ship at 800 feet, paralleling ship course.

Break altitude is 800 feet, and all breaks will be level to the left. The break interval is determined by the last aircraft in the landing pattern. A 15-20 second break interval will correspond to a 40- 60 second landing interval.

No breaks will be performed more than 4 Nm ahead of the ship (deconfliction with possible launching aircraft). If you are unable to break before 4 Nm, you will have to depart and reenter the pattern.

To accomplish this, maintain 800 feet until 5 Nm, then climb to 1,200 feet and execute a left-hand arc back to the initial.
Unlike in Overhead landing procedures at the field, the “Break call” is mandatory even if no AI are in the flight, else there is no way the code knows that you are entering the landing pattern.

If you don’t call for Overhead break, the LSO will not be available.

Carrier Landing Pattern:

The carrier landing pattern is nearly identical to the landing pattern at a land base. The biggest difference is that the 180 and Abeam positions are collocated at the carrier.
Additionally, the downwind heading of the ship is the reciprocal of the BMS BRC
(ship heading -10°)-180°. If the ship’s heading is 360° BRC is 350° and the downwind heading is 170°

‘real life would be simply ship heading = BRC -180° => with the same example, downwind would be 180°’
But nothing is ever simple in BMS…

When established on downwind, individual aircraft will descend to pattern altitude of 600 feet, perform landing checks and closely monitor the abeam distance.

The LSO will enter contact with the landing aircraft on the Tower Frequency with a “Paddle Contact” call. From this point, follow LSO instructions.

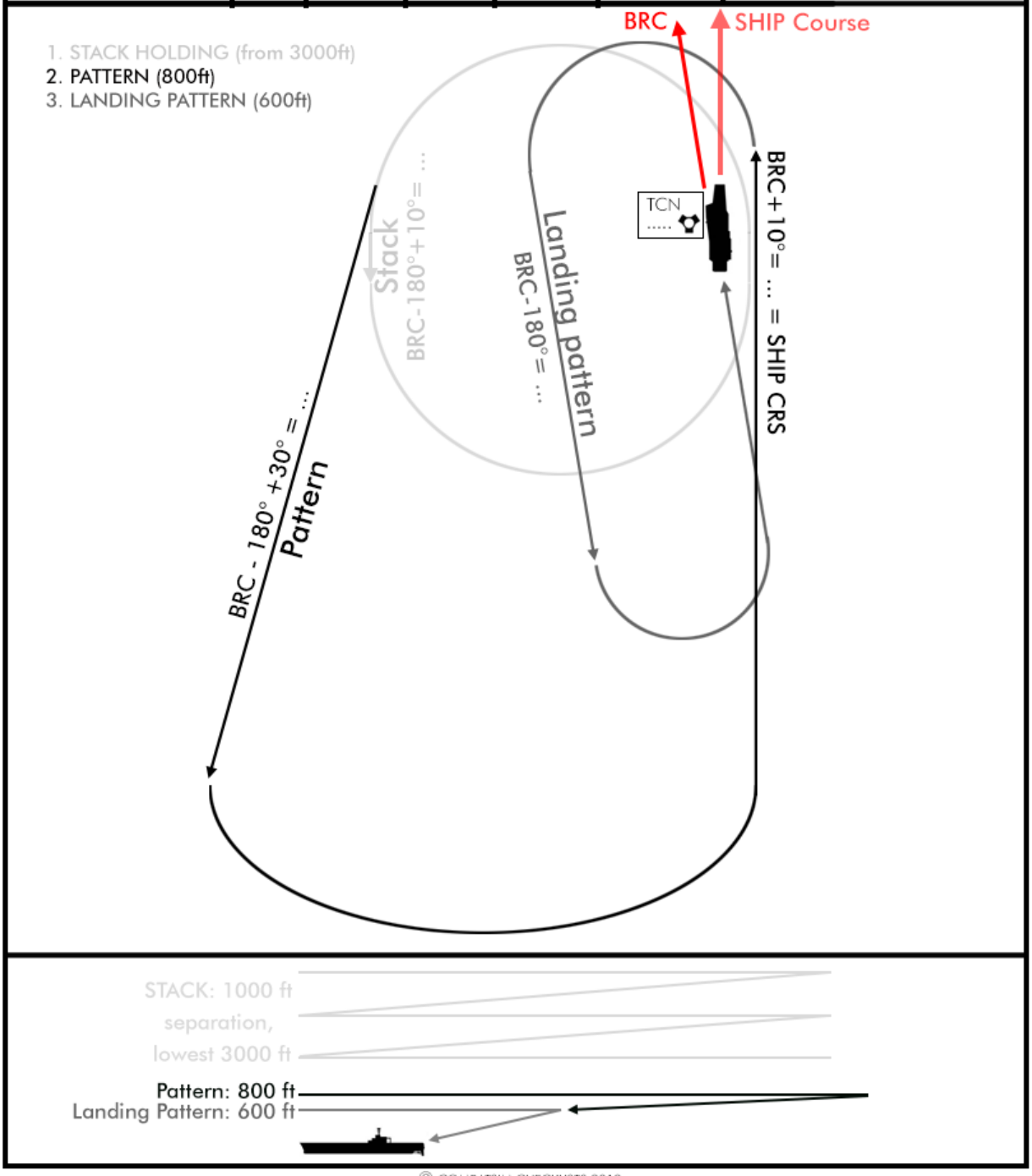
The Case 1 recovery procedure is illustrated on the next chart:

BMS NAVIGATION VOLUME

CARRIER CASE 1 RECOVERY

Date: 05 January 2019

CARRIERS:	TCN:	ILS:	GND:	TWR:	APP/DEP:
ENTREPRISE CVN-65	012X	108.55	265.3	265.2	265.1
C. VINSON CVN-70	010X	111.7	270.3	270.2	270.1
ROOSEVELT CVN-71	011X	110.1	271.3	271.2	271.1
TAKR KUZNETSOV	013X	111.1	363.3	363.2	363.1
LIAONING CV-16	014X	108.3	272.3	272.2	272.1



CARRIER CASE 1 RECOVERY

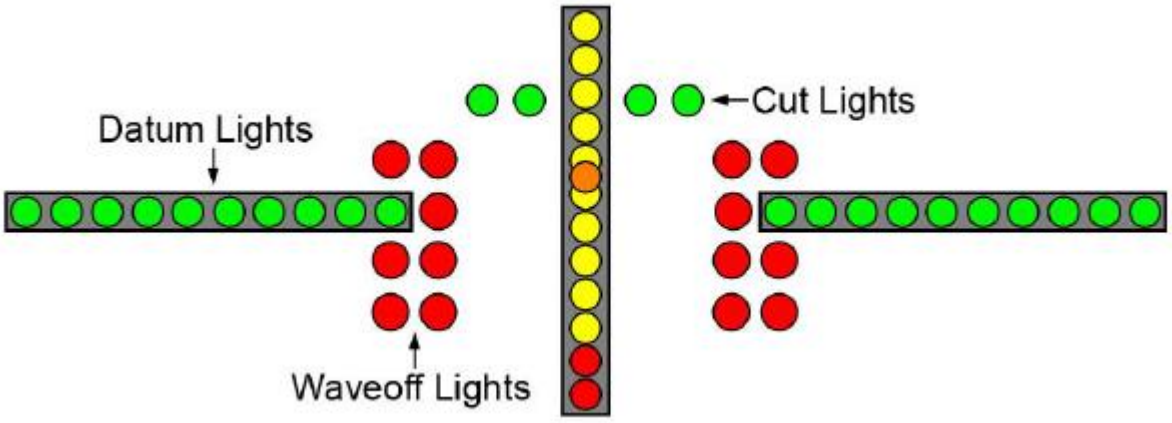
NOT FOR REAL NAVIGATION - FALCON 4 BMS ONLY

5.4.2 Call the ball

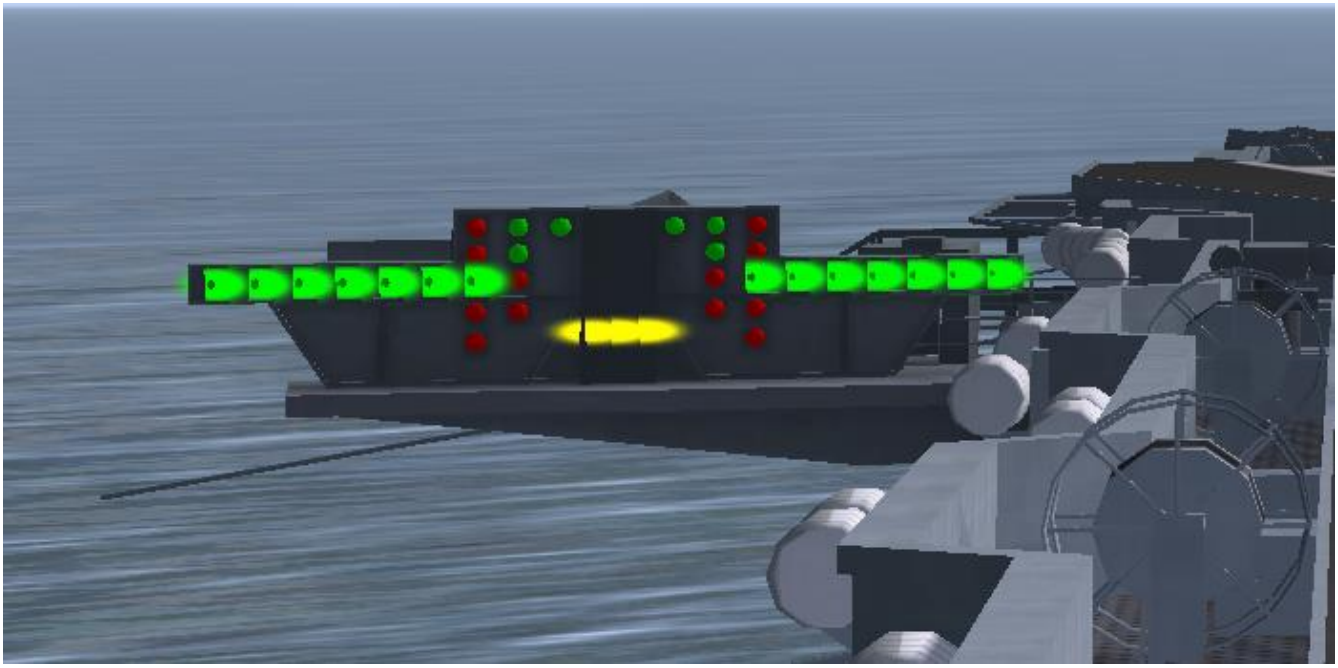
At three quarters of a nautical mile the LSO on the tower frequency will ask the landing pilot to “call the ball”

The pilot should then confirm that he has the “meatball’ in sight and give his aircraft type and fuel remaining. From this point the LSO will guide the pilot to the deck.

The meatball is the Fresnel lens on the left side of the landing deck which provide visual cue of the optimal glideslope to the landing pilot. It also features cut lights and wave-off lights, but these are not implemented in BMS.
It features a datum row of green lights forming a horizontal line representing the optimal glideslope and the meatball itself which is a light moving up and down on the vertical axis.



The position of the yellow ball relative to the green datum lights indicates the relative position of the aircraft to the desired glidepath. when the ball is above the datum lights (a high ball), the aircraft is above the glidepath; conversely, a low ball indicates the aircraft is below glidepath.
When the ball and the datum lights are aligned horizontally, the aircraft is on glidepath.



As a pilot in the groove (final approach) you concentrate on keeping the yellow ball aligned with the green datum light to stay on the ideal glidepath.

5.4.3 Meatball Dicta for pilots

- Attempt to fly the “cresting” ball, because slightly above glideslope (high) is better than below (low).
- Never lead a low or slow.
- Always lead a high or fast.
- If low and slow, correct low then slow.
- If high and fast, correct fast then high.
- Fly the ball all the way to touchdown.
- Never re-centre a high ball in close but stop a rising ball.

5.4.4 LSO radio calls

The BMS LSO will attempt to correct the final approach of the landing aircraft. This is done on the tower frequency, so no frequency change is required. The first call of the LSO will be “Paddle contact” to confirm he has you visual and then a “call the ball” call at ¾ Nm.

The call the ball is the only LSO call needing a pilot answer. The pilot needs to confirm that he has the meatball in sight, confirm his aircraft type and the fuel state.

Calling the Ball from the “Carrier Menu” is mandatory. Failure to do so will prevent the LSO to guide you. The frequency will remain silent.

To communicate with pilots the LSO uses several preformatted messages which all have a very specific meaning. None of them (except the call the ball) should be acknowledged by the pilot.
Here is an explanation of the LSO vocabulary:

Paddle contact:	The LSO initiates contact with the landing aircraft.
Call the ball:	Directive call to confirm visual with the meatball and state aircraft type and fuel state.
Roger ball:	LSO acknowledges the pilot ball call.
Drop your hook:	Self-explanatory – comply unless you do a touch and go.
You’re (a little) high:	Aircraft is (slightly) above glide path. Pilot should adjust sink rate with (less) power to establish centred ball.

You're (a little) low:	Aircraft is (slightly) below glide path. Pilot should adjust sink rate with (more) power to establish Centre ball.
You are on centerline:	Self-explanatory – no corrective action required
You are on glideslope:	Self-explanatory – no corrective action required
You're lined up left:	Aircraft has undershot/overshot centerline to the left. Reestablish lineup by going right.
You're lined up right:	Aircraft has undershot/overshot centerline to the right. Reestablish lineup by going left.
Easy with your wings:	Magnitude of line-up correction was excessive. Reduce magnitude of line-up corrections to intercept and reestablish centerline.
Easy with your nose:	Magnitude of nose attitude correction was excessive. Reduce magnitude of nose attitude to intercept and reestablish optimum aircraft attitude.
Easy with it:	Magnitude of power corrections was excessive. Reduce magnitude of power correction to intercept and reestablish optimum glidepath
A little power:	Aircraft is decelerating or settling. Correct with more power
Power:	Aircraft is low and/or slow: Add power
Burner:	Aircraft is extremely underpowered. Select afterburner power (and usually go around)
Don't go low:	Aircraft will settle below optimum glidepath. Check sink rate and meatball to avoid going below the glidepath.
Don't go high:	Aircraft is on or above glideslope with insufficient rate of descent to maintain a constant descent. Adjust power / attitude to prevent the ball from rising.
Hold what you've got:	Normally this call is made when the Fresnel lens indication is invalid, which never happens in BMS. The LSO overrules the ball indication. It should normally be followed by a fly the ball call as the Fresnel lens indication becomes valid again.
Cut:	Aircraft is in position to land. It should be used only for barricade arrestment as pilots engage full power in case of a bolter.
Bolter:	Indicative call to inform the pilot that the hook did not catch any wire
Wave-off	Directive call to execute a wave-off (go around)

Wave-off / Bolters

Wave-offs are the equivalent of missed approach procedures on land-based runways. The LSO will call the wave-off and the pilot will have to abort the approach. As with any missed approach, it always starts with a climb.

Wave-offs are MANDATORY. All wave-offs are made up the angled deck unless otherwise directed by the LSO or the tower (i.e. “wave-off starboard side”). Wave-offs may result from a fouled deck, winds out of limits, or aircraft not being set up for a safe landing. To perform a wave-off, simultaneously advance power to military (burner if necessary), retract speed brakes, maintain landing attitude (not to exceed optimum AOA), level wings, and climb up the angled deck. Verify a positive rate of climb and maintain optimum AOA. Once you have established a positive rate of climb and you are abeam the bow, use a shallow right turn to parallel the ship’s course. Climb to 600 feet and turn downwind with proper interval.

A bolter is a situation where the aircraft misses all the wires on carrier landing and will not be stopped.
The LSO will call the bolter signifying to the pilot that he will not be stopped and should therefore take off again.
Since all carrier landings are supposed to apply full dry power of full afterburner depending on the aircraft type (F-14D in real life do not use burner on launch) a bolter situation doesn’t require any specific action as the aircraft will take up speed and be in flying status as soon as the deck is not under the wheels anymore. All the pilot has to do is to regain positive attitude and apply launch procedures as usual.

LSO grades

There are no LSO grades implemented in BMS.

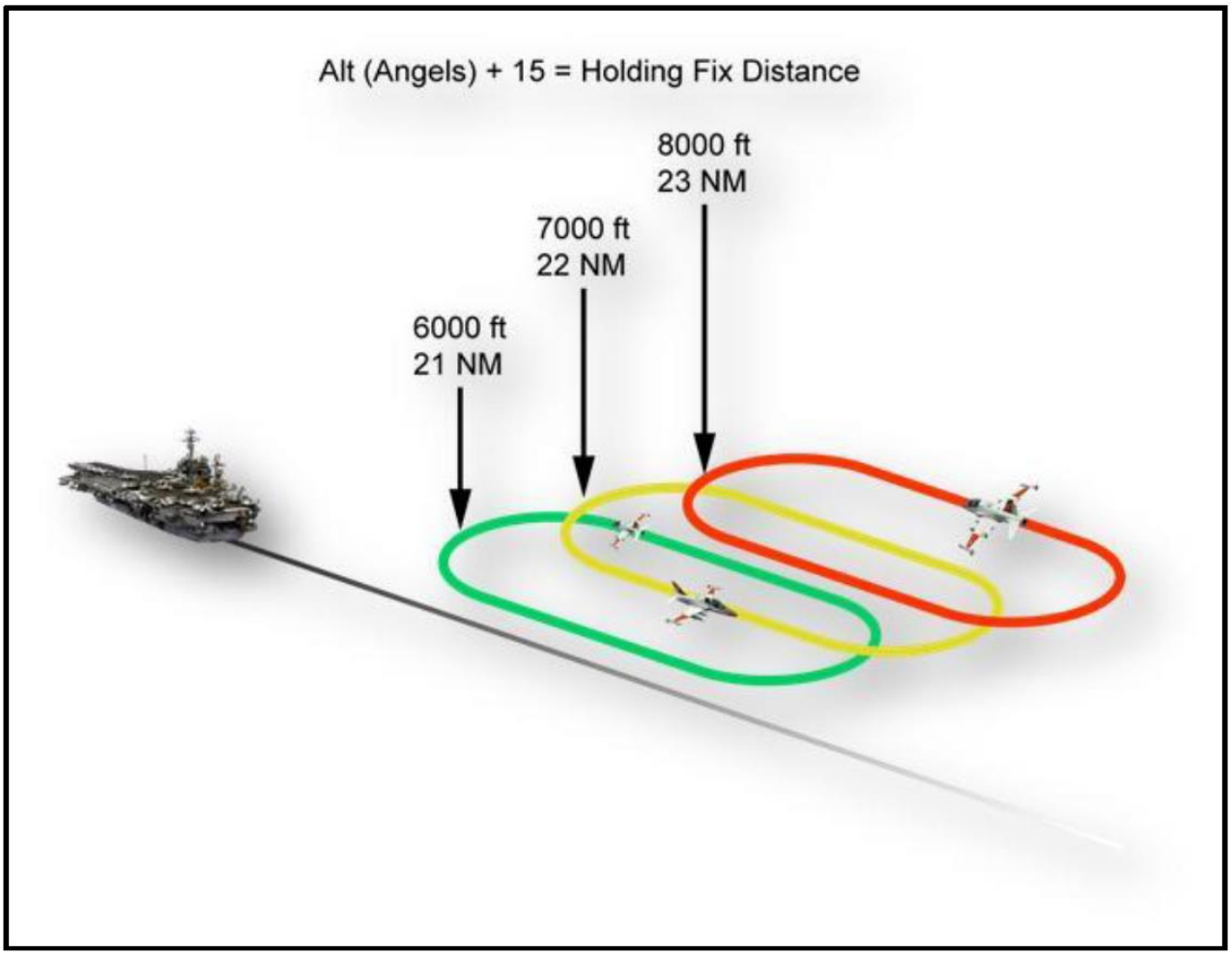
5.4.5 Case 3 recovery

The Case III recovery is used for all night operations, as well as during the day when the weather is below Case I minimums. Case III recoveries are limited to single aircraft only.

Pattern:

After initial contact with Marshall on the approach channel, the controller will vector each aircraft to the initial approach fix (IAF). Ideally, the holding fix will be on the 180° radial relative from the carrier' BRC

Aircraft will hold on the assigned radial at a distance equal to 1 NM for every 1,000 feet of altitude plus 15.
The lowest possible assignment altitude is 6,000 feet.
The first holding point is therefore at 21 DME / 6000 ft, the second at 22 DME / 7000 ft, the third at 23 DME / 8000 ft, …
Please note, a flight of 4 will be separated in the holdings by 1000 feet and the aircraft will remain at their assigned altitude in the holding until they receive their Charlie call.
The figure below illustrates the Case III Marshal pattern .



The holding pattern is a six-minute left-hand pattern. (although AI don't fly racetracks but constant turns =circles).
Unless otherwise briefed, the pattern will be flown at max conserve fuel flow or standard holding airspeed of 300 kts. Two-minute legs and one-minute turns are normally used for the pattern.
Aircraft in the stack will be separated by 1,000 feet vertically.

When time to leave the stack, Marshall will call "Charlie Now" with bearing and BRC.

Approach:
Upon commencing the approach, aircraft will establish a 4,000 feet per minute rate of descent at 250 KIAS.

At 5,000 feet (platform), "Report Platform" call shall be sent to Marshall (on approach frequency) and the rate of descent will be reduced to 2,000 feet per minute. At some point during the penetration or level off, Marshal will switch the aircrew to the Tower control frequency.

This will be maintained until reaching the level-off altitude of 1,200 feet.

Landing checks will be initiated at 10 DME, and aircraft will reduce speed to cross 6 DME at 150 kts. Landing gear should be down no later than 8 DME. At 6 DME, aircraft will slow to final approach speed

ILS lock shall be established during the penetration, at around 3NM, if the readout on the approach radar scope confirms ILS correct position, the Tower controller will direct, "fly the needles."

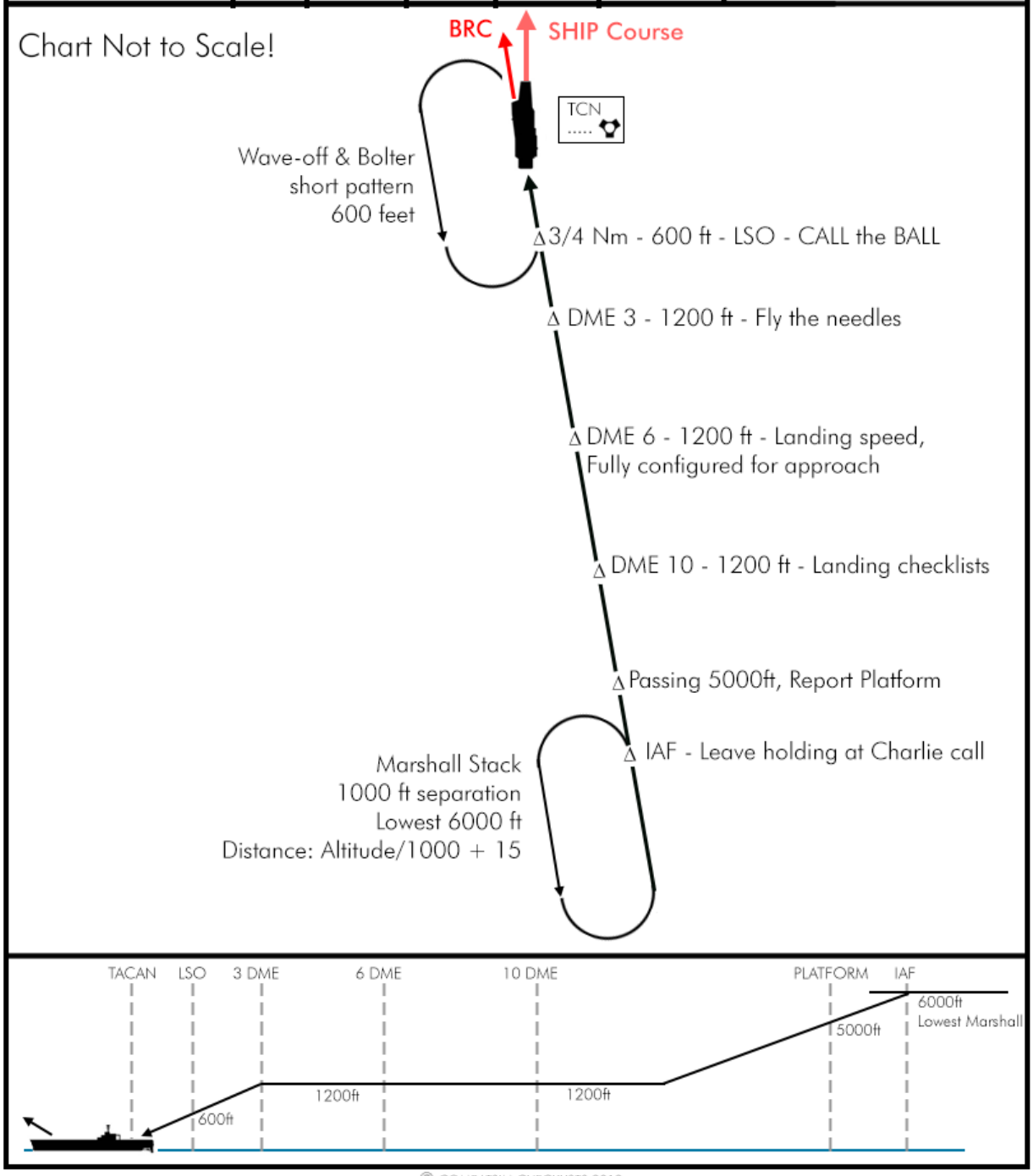
The LSO will enter contact with the landing aircraft on the Tower Frequency with a "Paddle Contact" call. From this point, follow LSO instructions.

BMS NAVIGATION VOLUME

CARRIER CASE 3 RECOVERY

Date: 05 January 2019

CARRIERS:	TCN:	ILS:	GND:	TWR:	APP/DEP:
ENTREPRISE CVN-65	012X	108.55	265.3	265.2	265.1
C. VINSON CVN-70	010X	111.7	270.3	270.2	270.1
ROOSEVELT CVN-71	011X	110.1	271.3	271.2	271.1
TAKR KUZNETSOV	013X	111.1	363.3	363.2	363.1
LIAONING CV-16	014X	108.3	272.3	272.2	272.1



CARRIER CASE 3 RECOVERY

NOT FOR REAL NAVIGATION - FALCON 4 BMS ONLY

5.5 Catching the Wire

BMS models each wire accurately.

At deck touch down, apply full power in case you missed a wire.
In such case you should hear a “Bolter Bolter Bolter” call on the frequency.

After the aircraft is stopped, the wire pulls the aircraft a bit backwards which free the hook from the wire.

Tower will switch you to the ground deck frequency.
You can raise your hook, fold your wings, and contact the ground frequency for parking on the deck.

Do not delay leaving the landing area as other aircraft might be in the groove landing right behind you.

Welcome back

Intentionally

Left

Blank

6. Aircraft in BMS for carrier operations

Naval ops for users are only available with an AFM aircraft:

- F/A-18C – fully implemented for carrier operation, 3D model and 3D cockpit
- AV-8b – fully implemented for carrier operation, 3D model and 3D cockpit
- SU-33 – Newly implemented for 4.34 but still features a F-16 3D cockpit
- F-14 – 3D model but very rough 3D cockpit front view only. (Ai only)
- Mig-29 – 3D model and old cockpit model with no specific carrier features. (Ai only)

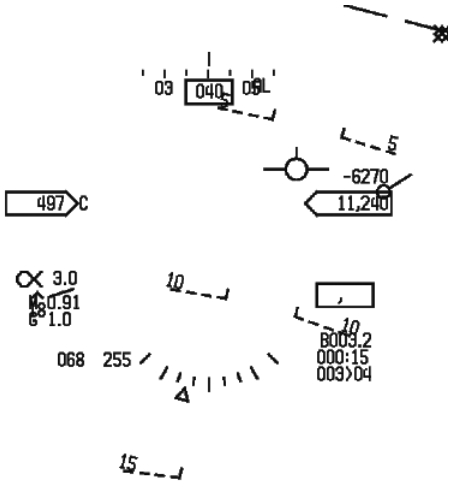
6.1 F/A-18C

The hornet has been constantly updated since BMS 2.0 and is meant to become the backbone of naval operations in BMS.

Since BMS 4.33 the hornet features a fully 'ramp-start able' 3D cockpit for the FA/18, A, B, C, D, CAF and RAAF Hornet models. Refer to the PDF located in the *Docs\04 Other Aircraft\01 F-18* folder for more details. This PDF was valid for 4.33 and further 4.34 changes are documented in the following pages. You will find a flight model document about the F-18C in the same folder.

The E and F Super hornet models use the C and D classic cockpits respectively.
The hornet is BMS 4.34 features auto flaps, auto throttle, auto trim amongst the most obvious difference from the F-16 avionic models.

Some specifics about the hornet:
NAV HUD:



- Vertical velocity indicator above altitude.
- Alpha, Mach, G, Peak G moved to their correct locations.
- AOA bracket set for (6-10 degrees AOA). The alpha display will blank out when the gear is down and FPM is in the bracket range. Also the cockpit AOA indicator lights will now match the correct F18 AOA range
- Peak Gs will only display if greater than 4 g's are pulled. If less than 4 g's are pulled, the g display will be removed when the gear is lowered.
- Mach display is removed when the gear is lowered.

- A water line indicator will appear when the FPM is constrained or the gear is lowered.

FLAPS:

Like the F-16 the F/A-18 features automatic LEF (Leading edge flaps) and TEF (Trailing edge flaps)

AUTO

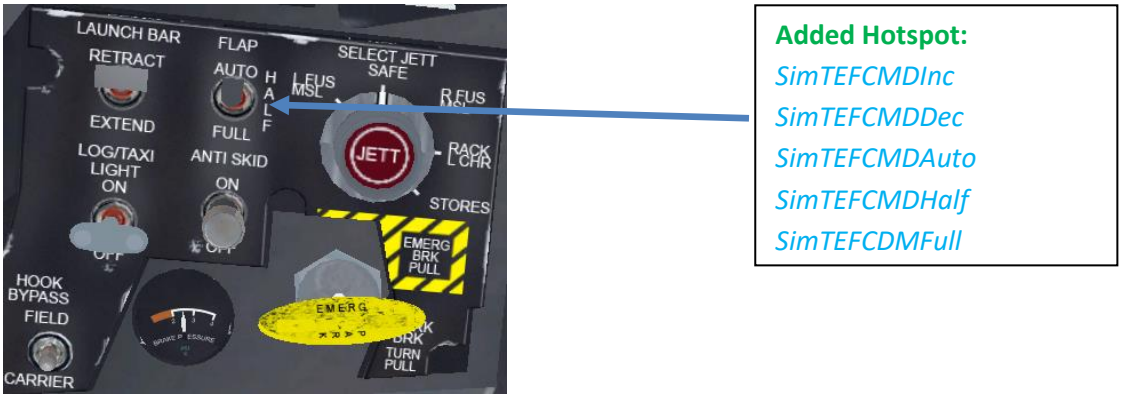
With weight off wheels, leading and trailing edge flaps are scheduled as a function of AOA.
With WOW, leading and trailing edge flaps and aileron droop are set to 0°.
This is the normal mode when flying.

HALF

Below 250 knots, leading edge flaps are scheduled as a function of AOA. Trailing edge flaps and aileron droop are scheduled as a function of airspeed to a maximum of 30° at approach airspeeds. Above 250 knots, the flaps operate in the auto flap up mode and the amber FLAPS light comes on. On the ground, the leading edge flaps are set to 12°. The trailing edge flaps and aileron droop are set to 30°. With the wing unlocked, aileron droop is set to 0°.

FULL

Below 250 knots, leading edge flaps are scheduled as a function of AOA. Trailing edge flaps and aileron droop are scheduled as afunction of airspeed to a maximum of 45° flaps and 42° aileron droop at approach airspeeds. Above 250 knots, the flaps operate in the auto flaps up mode and the amber FLAPS light comes on. On the ground, the leading edge flaps are set to 12°. The trailing edge flaps are set to 43° to 45° and aileron droop to 42°. With the wings unlocked, aileron droop is set to 0°.



The default key assignment for *SimTEFCMDInc* is *Shft F12* and for *SimTEFCMDDec Shft F11*.

SPEEDBRAKES

The F/A-18 A-D model aircraft will auto retract the speedbrake when aircraft g is 6 or greater, AOA is greater than 28, or the gear are down and airspeed is below 250 knots.

PITCH TRIMMING

When the landing gear is extended for landing the pitch trims trim the AOA, you have to adjust the pitch trim to set the correct AOA for landing. The initial AOA trim value is taken when lowering the gear.

WING FOLD

The wings fold using either the cockpit or keystroke (*AFWingFoldToggle; AFWingFoldUp & AFWingFoldDown).*

FORMATION LIGHTS

Added new callbacks (*SimStepFormationLightsUp, SimStepFormationLightsDown*) to control the formation lights. Currently three states (0%, 50% and 100%) are implemented for various AC.

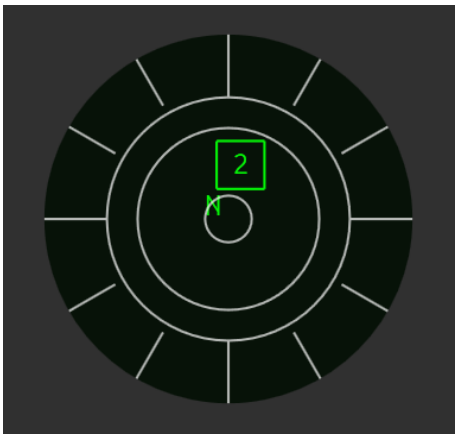
NWS

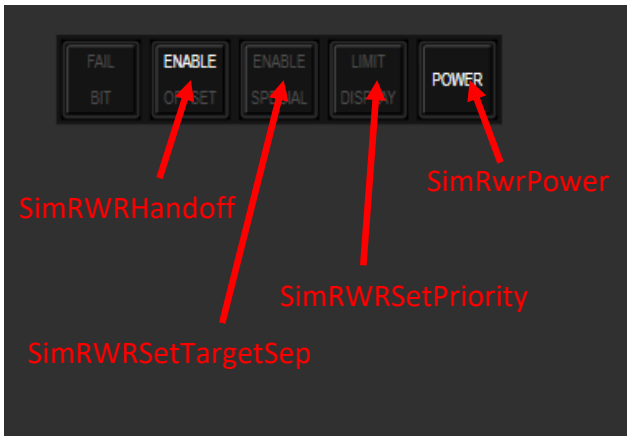
To allow carrier operations the NWS of the hornet has twice the rate of the F-16 NWS.

AN/ALR67(v)3 RWR

The An/ALR67(v)3 RWR used in classic Hornets around the world has been partially modelled. This system gives RWR indications both in the RWR display and in the HUD. Indications on the HUD simply mirror the RWR display with threats at 12 o'clock represented at the top of the HUD, those at 3 o'clock on the right side of the HUD etc.

A longer line indicates the threat/radar is in the inner circle of the RWR and a shorter line means the threat is in the outer RWR circle. A flashing line indicates a missile launch has been detected coming from the threat.
E through K band (2 to 40 GHz) Direction-finding accuracy: 15 degrees (E through K band); omnidirectional (C/D band)





System runs periodical self-tests in background. Pilot can initiate manual Self-Test.

ENABLE OFFSET Button	Select highest priority target for composite audio, held for selection browsing
ENABLE SPECIAL Button	Separates overlapping contacts on scope
LIMIT DISPLAY Button	Selects priority mode
POWER Button	Power ups system

GAIN Switch (F-18)

The GAIN switch is located on the left console, FCS panel. The GAIN switch overrides the LEF and TEF settings to a default position of 3° down. The toggle callback is *SimF18FCSGainToggle* is *Shift Ctrl Alt G.*

ORIDE:

When the GAIN switch is in ORIDE and the FLAP switch in AUTO, the leading and trailing edge flaps are fixed to 3° down and will not vary with airspeed and AOA. (*SimF18FCSGainORIDE*)

NORM:

When the GAIN switch is in NORM position FLAP operations are as described under 3.1 FLAP Switch (F-18) farther below. (*SimF18FCSGainNORM*)

Added Hotspot:
SimF18FCSGainToggle
SimF18FCSGainNORM
SimF18FCSGainORIDE

➔ Note:
The guard is animated but the switch is not visible

T/O TRIM Button (F-18)

The T/O Trim button is in the centre of the rudder trim knob on the FCS panel. With WOW holding the button pressed it sets control surfaces for Take Off. For the catapult to launch the F-18 must be set to take off trim, so press the keystroke for a few seconds to set take-off trims.

Added Hotspot:
SimF18FCSTOTrim

The default key assignment for *SimF18FCSTOTrim* is *Shift Ctrl Alt T.*

LAUNCH BAR Switch (F-18)

The Launch Bar switch on the forward left console has been added. Now you have to extend the Launch Bar (*SimLaunchBarEXTEND*) in order to get hooked to the catapult. After connecting with the shuttle and prior to launch the Launch Bar must be retracted again (*SimLaunchBarRETRACTSim*). Otherwise gear retraction is impossible.

Added Hotspot:
SimLaunchBarToggle
SimLaunchBarEXTEND
SimLaunchBarRETRACTSim

The default key assignment for *SimLaunchBarToggle* is *Shift Ctrl Alt L.*

AUTO THROTTLE (F-18)

The automatic throttle control is a two-mode system that automatically maintains angle of attack (approach mode) or airspeed (cruise mode). In the real jet the button is located on front side of the left throttle. It can be programmed to your warthog split throttle should you have one. There is no cockpit hotspot for the auto-throttle

ATC APPROACH Mode
With the FLAP switch set to HALF or FULL the thrust is set to maintain the AOA when the ATC button is pressed.

ATC CRUISE Mode
With the FLAP switch set to AUTO the thrust is set to maintain the current airspeed when the ATC button is pressed.
The default key assignment for *SimF18ThrottleATC* is *Shift Ctrl Alt A.*

G LIMITER

The G limiter prevents exceeding the aircraft positive g limit under most conditions while permitting full symmetrical and unsymmetrical (rolling) manoeuvring.

Longitudinal stick displacement required to achieve command limit g varies with airspeed and gross weight. When the command limit g is reached, additional aft stick does not increase g.

The G limiter in the F/A-18C is depending on Gross Weight (GW) and Mach (speed) except the negative G limit which is fixed at -3.0 g at all gross weights and stores loading.

Below 44,000 pounds gross weight, the positive symmetrical command limit is calculated based on fuel state and stores loading.
Max load factor in subsonic when GW < 32357 lbs is 7.5 G.

Between 32357 lbs and 44 000 lbs Max load factor in subsonic is linearly scaled between 7.5 G and 5.5 G

Above 44,000 pounds gross weight, the positive symmetrical command limit is fixed at 5.5 g.

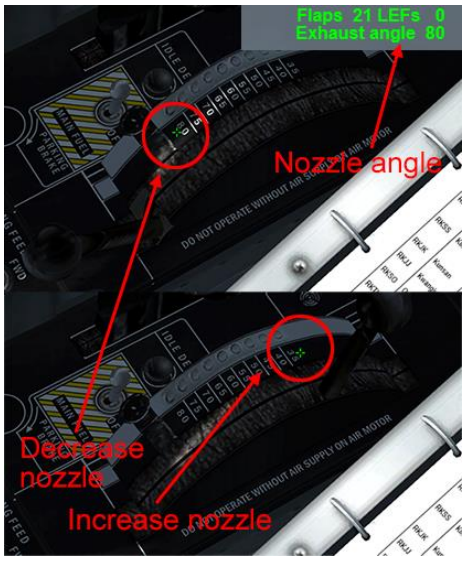
In transonic region (Mach 0.9 to 1.1), G is limited to 5G.

The G limiter may be overridden for emergency use by momentarily pressing the paddle switch with the control stick near full aft. Command limit g is then increased by 33%.
Using the paddle, you can increase the current G limit by 1/3: thus, if your current G limit is 5.5, using the paddle you can pull 7.15G.
If your G limit is 7.5, using the paddle you can pull up to 10G

G overshoot can occur under any flight conditions. G should be continuously monitored.

6.2 AV-8B & AV-8B+

The AV-8B & AV-8B+ have received some love in BMS 4.35 to ensure better interaction with the USS WASP. The BMS manual chapter 8.3.5 covers the basics for mastering the Harrier in BMS so do not hesitate to refer to it. This manual will concentrate more on shipborne operations from the USS WASP. The Harrier can also be used on supercarriers but not from deck of destroyers.
As mentioned earlier in this manual, AI and human piloted Harriers will behave differently on the ship.
The AI will always use catapults and arrestor wires whereas the humans can use both the catapult and vertical operations.
Max gross weight for vertical operation is 25-26000 Lbs.
Max gross weight for STO (Short Take-Off) from WASP is 25-26000 Lbs. up to 23000Lbs you can start from position #6 to accommodate ATC, if heavier, start as far back as possible.
Max Landing weight is 26000 Lbs.
Most of the time you will have to take off with less fuel and go straight to the tanker after departure to fill the jet up (on that note, the Harriers are AAR capable but they will refuel just like the F-16, that means the refueller probe will connect behind the canopy and not on the Harrier extended probe (probe & drogue is not yet implemented)



Specific controls for shipborne operations are obviously the nozzle rotation angle and the 2 flaps modes.
Nozzle rotation is possible with either callbacks or hotspots and are incremented by 10° from 0' (horizontal) to 120° (max rearwards rotation) - 80° being vertical. The hotspots are identified on the right picture. Please note the cockpit graduations are reversed and the correct nozzle angle indicator is on the top right corner of your screen in green text.

The flaps modes are either STOL (flaps set automatically according to gear position) or Cruise (Flaps set automatically according to airspeed) this is only set through the cockpit hotspot.

6.3 F-14

The F-14 tomcat is available in different model (F-14A, B, D & aggressor) and features an acceptable 3D model but a very crude cockpit, which at least benefits from being different than the F-16.

Although flyable by the user the current implementation really doesn't make it relevant for carrier use and it best left for the AI for the following reasons

- The wing fold mechanism is automatic and the human player cannot manage it through keystrokes.
- There is not launch bar implemented
- There is no hook implemented

As a consequence the Ai are perfectly able to use it from the carrier but not the players. It's a shame because the model is gorgeous.

6.4 Su-33 (Russia) &J-15 (Chinese)

The Su-33 and its Chinese version J-15, beside gorgeous new 3D model have dedicated flight models. One of the new features is the G limiter. the SU33/J-15 AOA is limited unless you use Paddle Override, which deactivates the AOA limiter.
The G limiter is depending on GW and Mach:
Under Mach .85 G limit = 9 , 435894 / weight
If Mach is between .085 and 1.25 G limit = 7 , 354323 / weight
If Mach is above 1.25 G limit = 7.5 , 382363 / weight

Unfortunately a decent cockpit was not done and they both fly with a F-16 cockpit.

6.5 Mig-29M

Although the BMS designation is wrong, the Mig-29M in our database is the navalised version of the famous fulcrum. The correct named should be Mig-29K. Regardless of the name issue the Mig-29 has a nice 3D model and a dedicated but old cockpit. The aircraft does not have specific carrier feature like wing folds and no visible hook.

Russian carriers don't launch aircraft with catapult so the 4.34 Mig29 might very well be launched from the carrier with a human at the controls but I have no idea if the same player will be able to trap the aircraft back on deck because of the lack of hook? I confess I have not tried.

Although it is very well flyable, it is more suitable for the AI.

6.6 Su-39

Another mis-designed naval aircraft in the BMS database is the Su-39, which should be the Su-25 UTM. Although called naval in the BMS database, the “Su-39” has no naval feature such as a visible hook. The 3D model is very crude and old, the skin as well and the cockpit defaults to the F-16.

Use it as AI only.

Intentionally

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7. Training Missions for NAVAL OPS

BMS 4.33 introduced better naval operations with new aircraft carrier models.

BMS 4.34 further refined the naval operations with the addition of red forces carrier and carrier borne aircraft and implementing specific ATC procedures around the carriers. The number of blue forces carriers have also been reduced to 3 (red forces have 2).

BMS 4.35 implemented the LHD-1 WASP & Harriers for V/STOL operations.

ATC is now able to implement Case 1 and Case 3 recoveries.

Naval operations are mostly performed with the F/A-18 & AV-8B aircraft as they feature full 3D cockpits and AFM (Advanced Flight Model) albeit not as detailed as the F-16.

The following chapters corresponds the BMS carrier operations training missions. The principles are the same as the missions in the training document (matter of fact they were part of the training document in 4.33, but have been moved in this document as they are more relevant here)

The training mission can be started from the TE tab of the UI, TRAINING part.

They are mission numbers:

- 23 for carrier launch,
- 24 for case 1 recovery and
- 25 for case 3 recovery.
- 26 for V/STOL operations.

7.1 MISSION 23: F/A-18 HORNET - Carrier Takeoff

PREAMBLE: This training mission assumes you are familiar with the basic operation of the aircraft and its communications systems. It is important to note that while there are some small customisations, the Hornet in BMS essentially uses the Viper's avionics.

LOCATION: On the deck of USS Enterprise CVN-65 - 35Nm West of Kunsan Airbase - South Korea
Please note, make sure you select the F-18D Training flight from the mission window, if you select the first flight without checking you will end up piloting a Hawkeye.

CONDITION: F/A-18D – Single ship – Callsign Spade 1-1
GW: 42365Lbs – 3 AIM-120C – 2 AIM-9X – 1 ATFLIR – 1 centreline Fuel tank
Max G: +7 / -2; Max airspeed: 600 KIAS / M1.6
Once in the cockpit the training scripts will freeze BMS and setup your systems accordingly.

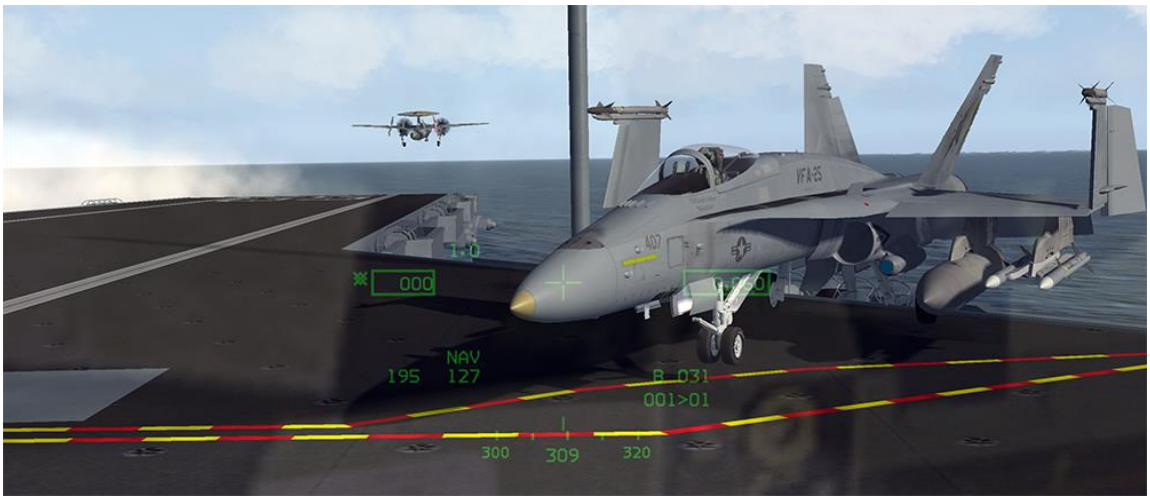
WEATHER: 0725LT TRL140 360/15Kt 9999 FEW 050 28/18 Q1013 NOSIG

GOAL: Successfully taxi to the catapult and launch the aircraft.

7.1.1 Taxi

Select the single ship F/A-18D Hornet in Package 4965. As always check the mission briefing for weather and other NOTAMS. Also ensure you have the communication frequencies for the Carrier ATC. Just like ground missions, the new radio code will assign presets for ground (2), tower (3) and departure (4).
You can commit to either RAMP or TAXI, for this training mission we will commit to TAXI but you can commit to RAMP if you prefer, ramping the F/A-18 is outside the scope of this training mission.

The AI jets are able to taxi on the carrier and will follow taxi points like on land.



Upon entering the cockpit, the aircraft will be hot and chained to the decks (chocks) with the wings folded.
Due to confined space on the deck it is preferable to leave the wings in the folded position until just before you are ready to enter the catapult zone.

As the carrier needs to steam into the wind to launch and recover aircraft get into the habit of contacting ATC early to allow the ship enough time to turn into the wind while you finish your ground checks.

Set the UHF radio to the carrier ground frequency which for the USS Entreprise is 265.3. As per your briefing it was assigned to preset #2 and request ready to taxi as usual with the ATC menu, ground page, 'ready to taxi' option. The deck controller will most likely state that you're number 2 and you should let the Hawkeye launch before you.

When ATC calls you back with your clearance to taxi, un-chock the aircraft and activate NWS. Stand on the brakes, the carrier decks unlike taxi apron is moving.
The rate of turn of the hornet NWS is much more important than the F-16 allowing much tighter turns on the deck of the carrier.

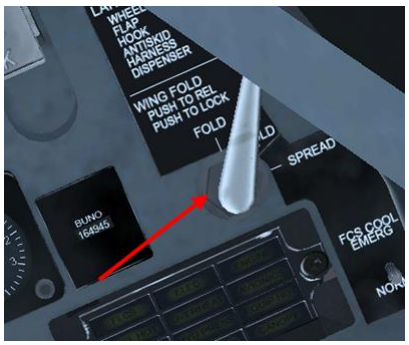
Once you have ensured the flight line is clear (i.e. no landing aircraft) taxi towards the port forward catapult, behind the Hawkeye. The jet blast deflectors will raise to protect you from the Hawkeye prop blast. Flight leads and element leads should always setup on the port catapult, the wingmen will always aim for the right catapult.

The deck controller will switch you to Pri-fly (tower frequency) as you are taxiing. Switch your UHF radio to 265.2 which is assigned to preset #3.

After the launch of the Hawkeye, the JBD will lower and the PRIFLY controller will clear you to line-up on the cat.

Before advancing the throttle, setup your aircraft for launch:

- Extend the wings and check visually that they lock into place



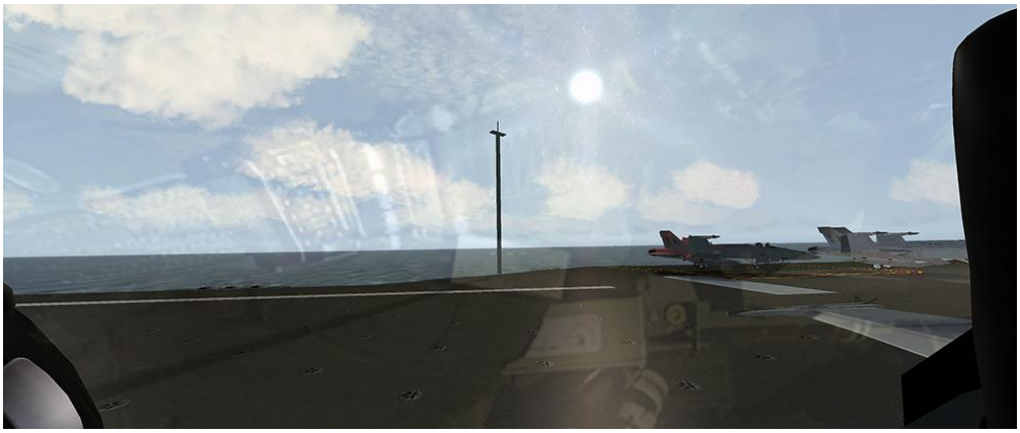
- Extend the launch bar otherwise you will not be able to connect to the catapult
- Set the FLAPS to HALF

- Set the trims to take off
  (Keep the keystroke depressed for a couple seconds).

Once your jet is configured call the tower to tell them you are ready for departure. Do not delay too much as calling ready assigns you the CAT. The tower will likely give you a position and hold instruction which means get on the cat and wait for final clearance.

7.1.2 On the Cat

Move forward at low speed and line up with the catapult rail. Continue at slow speed until the aircraft connects with the shuttle. There is no need to stop the aircraft; if you are aligned and slow the aircraft will stop and 'catch' the catapult. To give you a distance reference, that should happen approximately abeam of the pole on your starboard side.



Now that the launch bar is attached to the catapult shuttle you must release it so it folds back in place once released from the shuttle catapulting your aircraft in the air. You can release it now, you don't have to wait till in the air (you will likely have no time. Failure to retract it before raising the gear may induce gear retraction failure. If that happens (And it will) simply lower the landing gear again (mind your speed) retract the launch bar and retract the landing gear again. That should do it. Careful pilots would abort the mission but in fairness, you fixed the issue and did not broke the jet.

At your assigned take off time the tower will give you winds and clear you to launch.

Check your flight controls are free and correct and check that the Jet Blast Deflectors have raised behind you prior to advance both your engines at full power (full afterburner in this case) You are ready for launch but you have no controls on when the launch will occur. The catapult steam needs first to build (you will notice more steam coming out of the catapult). Once the pressure is sufficient for your gross weight, the carrier will automatically fire the catapult and you will be launched from the carrier deck.

Note: if you set Take-off trim the aircraft will fly out on its own pitching up after launch. You may release the stick for the catapult launch. The only occasion the pilots need to apply back pressure on the stick for take-off is when take-off trims weren't set properly. Once a positive rate of climb has been achieved retract the landing gear and set the flaps to AUTO. (You did retract the launch bar didn't you?) As you launched from the port bow catapult, climb straight ahead and avoid turning right (into the starboard catapult path) or left (into the waist catapult path)

Switch your UHF radio to departure and report airborne. You may now proceed as per standard navigation procedures. Well done you successfully launched from the carrier deck.
There's no real difficulty in launching, except maybe not forgetting to retract the launch bar once in the shuttle. The hardest is yet to come, coming back for landing!!

Intentionally

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7.2 MISSION 24: F/A-18 HORNET – CASE 1 Recovery

PREAMBLE: This training mission assumes you are familiar with the basic operation of the aircraft and its communications systems. It is important to note that while there are some small customisations, the Hornet in BMS essentially uses the Viper's avionics.

LOCATION: In flight, 14miles west of CVN-65 USS Enterprise.

CONDITION: F/A-18D – Single ship – Callsign Spade 1-1
GW: 42365Lbs – 3 AIM-120C – 2 AIM-9X – 1 ATFLIR – 1 centreline Fuel tank
Max G: +7 / -2; Max airspeed: 600 KIAS / M1.6
Once in the cockpit the training scripts will freeze BMS and setup your systems accordingly.

WEATHER: 0830LT TRL140 113/15Kt 9999 FEW 050 28/18 Q1013 NOSIG

Select the single ship F/A-18D Hornet in Package 4965. As always ensure you check the mission briefing for weather and other NOTAMS. Also ensure you have the communication frequencies for the Carrier ATC.

Upon entering the cockpit, the aircraft will be approximately 3000 feet at 350 knots heading 090. You will be just over STPT 9.

Select STPT 10, contact the Carrier Approach frequency on 265.1 (preset #4) and request "Inbound Mother"

Please note This is not done on the usual approach page of the ATC menu but rather the carrier page of the ATC menu.

The approach controller will answer with Mother state (Case1 or Case3) in this case Case1 and the BRC (Base recovery Course) of 113 and will ask you to report visual with the carrier. BRC is the QFU of the angled landing deck which corresponds to the reported wind in BMS

As you approach the carrier, report visual as instructed with the "Report see you" option of the ATC menu Carrier page. The controller will acknowledge your call and give you the Marshall altitude of 3000 feet at this time. Then he will instruct you to switch to tower.

Case 1 recoveries are a three steps approach scenario:

- Hold at Marshall altitude in the stack directly above the ship.
- Depart the stack to the 800 feet pattern when issued a Charlie call. Leave the stack on BRC+210° (or 30° off the reciprocal of BRC if you prefer) to turn back towards the ship aligned with BRC, outboard the ship on the starboard side of ship. This whole pattern is flown at 800 feet.
- Overhead the ship again (actually just outboard), the flight breaks in the landing pattern in sequence. Break should always be called on the radio (LSO is Ai and needs to know)
  Landing pattern is 600 feet and should be maintained until you are under the LSO authority.

You have just been issued you Marshall altitude of 3000 feet and are now on the tower frequency. Next step is to enter the stack at 3000 feet above the ship. A quick look tells you there is one flight of four hornet about to leave the stack now (You have heard them before on the Marshall frequency). Reduce speed to best conserve

(around 300 kts) Fly direct to the ship and enter the stack holding pattern.
Tower may update the BRC. A good idea if you're concerned about forgetting BRC (which is the base of many headings calculations) is to input it in the CRS setting of the ILS DED page, or on the HSI. That way when you need to have a quick reminder of what it is, it's right there. USS enterprise tacan is 12X.

In this training scenario you are single ship but in the case of a 2 or 4 ship scenario your flight would be placed in a wingtip right formation and kept close until the break in the landing pattern. Right formation because all turns over the ship are left. Flights in the stack are separated by 1000 feet. You may have aircraft below and above you. Make a note of aircraft below you departing the stack as once they depart, you are automatically cleared to descend to the altitude stack vacated 1000 feet below you. The flight above you will descend 1000 feet as well, so do not delay your descent. Stacks are busy places, keep a sharp look-out and a good SA by listening to the radio.

Once above the ship, turn left in the holding. Once on downwind level the aircraft, have a quick look left and you should see the ship.

Once confident of your position in the holding, turn back to BRC (113) but add 10° to the right to compensate for the ship course: 123° heading maintaining your speed and altitude. Rolling out again, you should not be far again from just above the ship:

The flight below you call the left break signalling that they enter the landing pattern overhead the ship at 800 feet. From that moment you will hear a lot of comms from these guys as each will be separately but in sequence under the LSO guidance which communicates on the tower frequency.
You still wait your Charlie call, so listen carefully to the radio the tower will at some point call you saying: Spade 1-1 Charlie now, BRC 113. That will usually call once the flight ahead of you landed (in 4.34 it was earlier, but for whatever reason BMS 4.35 became more conservative and broke a bit the tight dynamic of carrier ops.

Anyway, the Charlie call is your cue to leave the stack 30° right of the BRC reciprocal. Since you already have calculated the reciprocal for your holding (293) 30° right is easy to get: 293+30=323°

Flying above the ship, turn left on 323°, descend to 800 feet and lower your hook. Stay within 5 Nm of the ship but turn back towards the ship whenever you feel there's enough turning room. Since the sequence is complicated enough you may elect to first reach 800 feet on the 323° heading before turning in which should give you plenty of room and still remain within 5Nm of mother.

Coming in on BRC (+10°), ensure you fly on the starboard side of the ship at 800 feet.

Break left and announce it on the radio with the "Report Overhead break" option of the Carrier page of the ATC menu. In the break, configure your aircraft for landing:

- Gear down
- Flaps Full
- Check Hook down

And descend to pattern altitude of 600 feet. Downwind is reciprocal of BRC again: 293°
Once established in downwind on the on-speed AOA, you may engage the auto throttle of the hornet. Remember there is no cockpit switch for that and must be managed through keystrokes or Hotas programming. The Auto throttle will maintain AOA when the flaps are set to Half or Full.
Once configured for landing on downwind, gauge your lateral separation from the ship on your left and time your final base turn.

Don’t lose sight of the ship as you turn to final and maintain 600 feet until the LSO calls contact. When he does he will ask you to call the ball. Answer his call with option 4 “Call the Ball” from the carrier page of the ATC menu.
Don’t even think about doing that with the keyboard, you have no time. You must use VAC (Voice activated Command) software or at least a HOTAS function for this. If you lose the stick you will foul your approach.
From here on the LSO will guide your approach by giving you lateral and vertical separation and comments about your speed. Follow his orders and aim for the third wire.

The auto throttle is a real game changer and basically all you have to do beside aligning slightly right of the landing deck (to compensate for the ship movement) is to place the FPM on the wires. If you did not use the auto throttle, you will have to manage the AOA and the FPM at the same time.

If all goes according to plan, you will control your crash landing on the deck and the hook will catch the one of the wires.

If the LSO issue a wave off, he considers your approach unsafe and wants you to try again. Stay in the landing pattern at 600 feet and turn downwind for another try.
If the LSO issue a bolter bolter bolter call, that means your hook did not connect any of the wire. Fly again and stay in the landing pattern for another try.

If you hear the tower ordering you to switch departure you have to contact departure and restart the full Case 1 procedure from the stack by re-contacting approach. Do not stay in the landing pattern as the LSO will not answer your ball call anyway.

But none of that will happen as your approach is textbook perfect and your hit the deck on the exact spot you planned. Engage burner anticipating a possible bolter but you can feel the deceleration once the hook catches the wire. Go idle, let the aircraft roll backward a bit, raise your hook, fold the wings, engage nose wheel steering. Tower will instruct to switch to ground frequency (preset 2) and taxi back to the parking position. Do not forget to chock (chain) the aircraft.

Welcome back on the ship and well done on your first trap. Get a shower now, you need it.

Intentionally

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7.3 MISSION 25: F/A-18 HORNET – CASE 3 Recovery

PREAMBLE: *This training mission assumes you are familiar with the basic operation of the aircraft and its communications systems. It is important to note that while there are some small customisations, the Hornet in BMS essentially uses the Viper's avionics.*

LOCATION: 15 miles South-West of CVN-65 USS Enterprise level at 20000 feet on top of the weather
Please note, you may choose any position in the flight. The most interesting position is the wingman #2 to have aircraft below and above you in the holding. This chapter will assume you took this position. But flying as lead works equally fine.

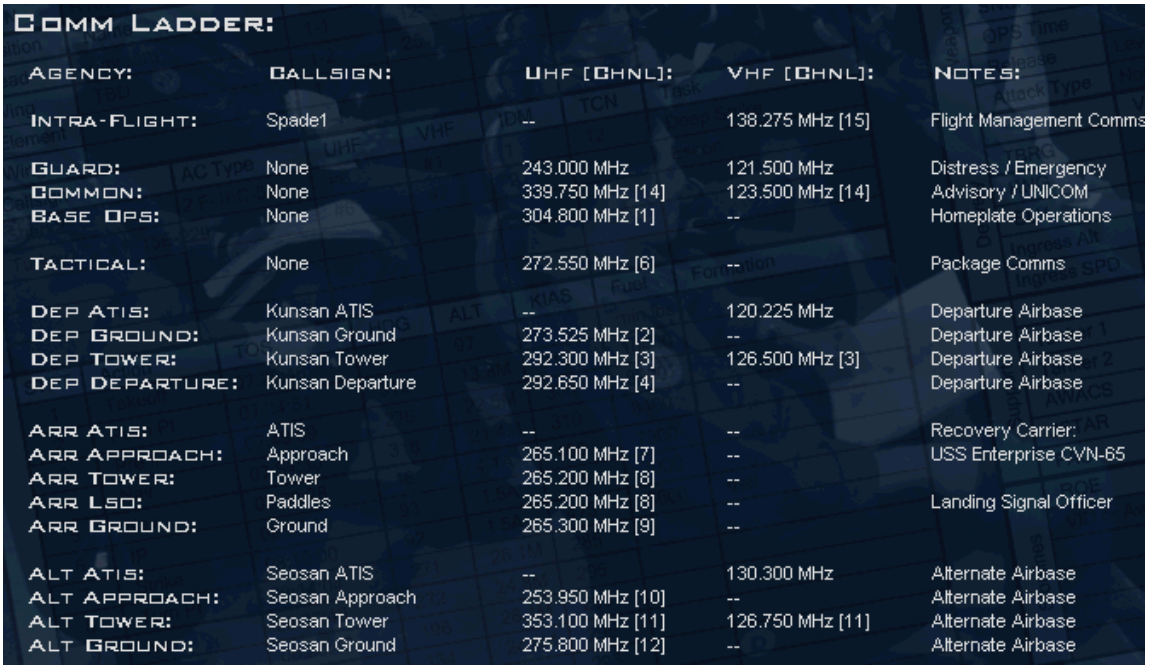
CONDITION: F/A-18C – Four ship – Callsign Spade 1-2
GW: 39300 Lbs – 3 AIM-120C – 2 AIM-9X – 1 ATFLIR – 3 fuel tanks
Max G: +7 / -2; Max airspeed: 600 KIAS / M1.6
Once in the cockpit the training scripts will freeze BMS and setup your systems accordingly.

WEATHER: 1725LT TRL140 145/20KT 4000 BR OVC025 25/23 Q995
Poor, Wind 145/20knots, 4km visibility, Mist, ceiling 2500 feet.

GOAL: Successfully trap the aircraft on the Carrier in case 3 conditions.

An interesting aspect of this flight is that home base and landing base are not the same. The flight takes off from land based Kunsan to deploy on the USS Enterprise cruising West of the Korean peninsula. As most of your flights have the same airbase for departure and landing you are probably used to always use the same preset for approach and tower. Well This here is made specifically to remind you that presets are just shortcuts. The real frequency behind the preset really matters.

In this flight if you punch preset 4 for talking to approach, Kunsan airbase will answer you that they don't have you on radar and you will look like a fool (ask me how I know?)
The briefing should be your first stop at mission planning and if you didn't read it chances are that you will not notice that the preset for the arrival approach frequency is not #4 but #7. Indeed, in a scenario were airbases are different, the presets are different as well.



COMM LADDER:

AGENCY:	CALLSIGN:	UHF [CHNL]:	VHF [CHNL]:	NOTES:
INTRA-FLIGHT:	Spade1	--	138.275 MHz [15]	Flight Management Comms
GUARD:	None	243.000 MHz	121.500 MHz	Distress / Emergency
COMMON:	None	339.750 MHz [14]	123.500 MHz [14]	Advisory / UNICOM
BASE OPS:	None	304.800 MHz [1]	--	Homeplate Operations
TACTICAL:	None	272.550 MHz [6]	--	Package Comms
DEP ATIS:	Kunsan ATIS	--	120.225 MHz	Departure Airbase
DEP GROUND:	Kunsan Ground	273.525 MHz [2]	--	Departure Airbase
DEP TOWER:	Kunsan Tower	292.300 MHz [3]	126.500 MHz [3]	Departure Airbase
DEP DEPARTURE:	Kunsan Departure	292.650 MHz [4]	--	Departure Airbase
ARR ATIS:	ATIS	--	--	Recovery Carrier:
ARR APPROACH:	Approach	265.100 MHz [7]	--	USS Enterprise CVN-65
ARR TOWER:	Tower	265.200 MHz [8]	--	
ARR LSO:	Paddles	265.200 MHz [8]	--	Landing Signal Officer
ARR GROUND:	Ground	265.300 MHz [9]	--	
ALT ATIS:	Seosan ATIS	--	130.300 MHz	Alternate Airbase
ALT APPROACH:	Seosan Approach	253.950 MHz [10]	--	Alternate Airbase
ALT TOWER:	Seosan Tower	353.100 MHz [11]	126.750 MHz [11]	Alternate Airbase
ALT GROUND:	Seosan Ground	275.800 MHz [12]	--	Alternate Airbase

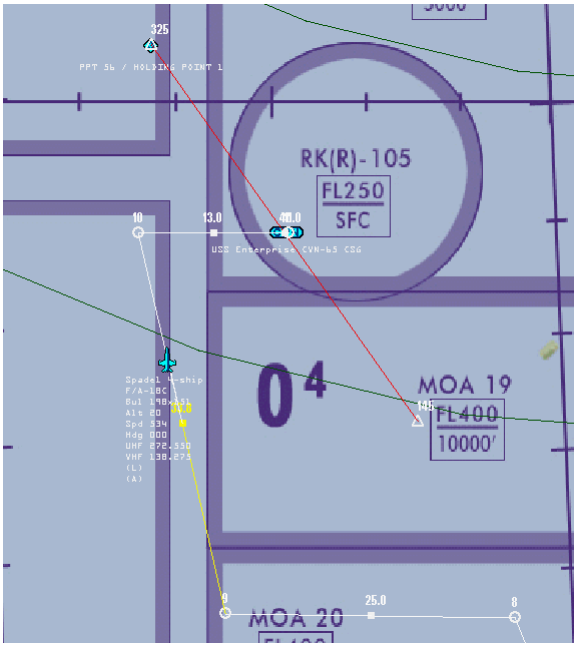
The training scripts will load all radios and navigation settings for you. Radios will be set to tactical #6, VHF will be set to your flight, Tacan to 12X for the USS Enterprise, ILS made on and set to 108.55 and your HSI will be set to tacan mode.

Case 3 recoveries are made in bad weather or at night. Visibility is therefore not very good and landing on a carrier with limited visibility is one of the greatest challenges in aviation.
This training mission is still a day landing but in poor weather. The carrier will be under Case 3 recovery procedures.

During Case 3 recovery, aircraft flights calling “inbound mother” will be separated and send to a different point for holding (IAF). They will be separated by 1000 feet altitude. The approach calculates the different IAF with the following rule: $(\frac{Altitude\ in\ feet}{1000} + 15\ Nm)$. The lowest possible holding altitude is 6000ft, making the distance 21Nm. Then all other aircraft will be separated by 1000 feet in altitude and 1Nm in distance.
Then one by one they will be given a signal (Charlie) to start their approach which is like a long straight in approach. First a straight in descent then a level until intercepting needles then the final approach under the carrier ALS. Please note, aircraft will remain at their assigned altitude in the hold until they receive their Charlie call. The carrier has a Tacan and in the absence of visual cues this will be your sole reference to your landing deck.

The approach is fairly simple considering you know what to do. The dynamic IAF point you must head to is a bit more complicated to find if you are not current in radio navigation. Luckily once in contact mother will guide you there.

The IAF are aligned with the ship course pending the angular error of the ship angled landing deck. A ship reporting a BRC of 360° will have its IAF on the reciprocal radial r-180° at a certain distance.
A ship with a BRC of 270° will have the IAF somewhere on R-090° - Always behind the ship.



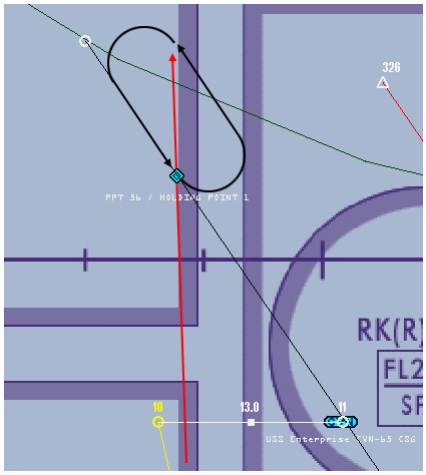
In our training scenario here, the ship has a BRC of 145 and thus will send aircraft recovering on the radial 325 (145+180) As you're coming from the southwest, picturing where the IAF is related to both you and the carrier is critical.
The picture on the right uses the ruler to identify BRC and it's reciprocal and a PPT is placed on the IAF your flight will be assigned to. As you see that IAF is due North of your position upon entering the TE.
Now of course you don't know that information upon entering the TE, it's given to you only when you contact the carrier. So you have to train to establish that picture in your mind. You know where the carrier is by looking at the bearing pointer on the HSI that points to the Tacan 12X and you know your heading. Try to picture an imaginary line from the carrier on that 325 radial and head for there.

Another way of course would be to set R-325° in your HSI course and intercept the radial and fly to DME point given by the carrier ATC. But doing so you might actually close on that point from the opposite direction (flying North-West on 325°) and once there you have to enter an holding which is pointed South-East (145°).
It would be better to try to have enough turning room and intercept that radial from further away flying towards the carrier rather than away from the carrier. Hence why picturing where that IAF is in relation to your actual position is so important.

Anyway just like land-based approach controllers the carrier controller will steer you to the IAF by giving you heading and altitude calls.

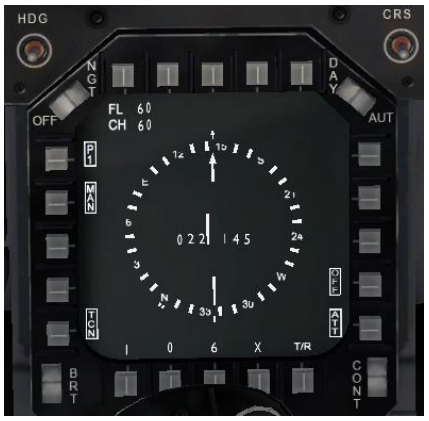
Supposing you entered this training mission as number 2, the flight will scatter a little bit when you enter 3D. Your flight lead will be a little ahead of you and started a descent. Try to acquire him on your FCR and follow him in the descent enroute to steerpoint #9. Since you are on tactical #6, you have IDM from all your flight members. At some point, lead will call to switch the UHF radio to the carrier approach frequency and immediately after he will request "inbound mother". The carrier controller will state the case 3 recovery in effect and give you the Marshall position being on R-325° about 21 Nm from the carrier (each flight member should get a different DME and holding altitude) You as Spade 1-2 is R325° DME 22, 7000 feet.

From this moment, you are all considered separate entities deconflicted by distance and altitude on your way to Marshall.



The carrier controller will issue headings and altitude to each of you. Follow the approach calls and fly to Marshall but try to think ahead of your holding geometry and entry so you are ready upon reaching the IAF. If the carrier sends you on R-325 for Marshal it means that BRC is 145. You should then plan to have your holding on the 325/145 heading with the end of the 145 leg (inbound) spot on the IAF.
Holdings are supposed to be 6 minutes in this case, 1-minute turns and 2-minute legs. All turns should be LEFT. As you see on the right picture a PPT has been placed on the expected holding point of Marshall and the left holding has been drawn. The red arrow is your estimated arrival course. As you notice, it's a perfect case for a parallel entry. Fly direct to the IAF following the ATC heading call and continue flying on that heading past the IAF point for about 60 to 90 seconds before turning back intercepting R-325 inbound the carrier tacan.

Once in the holding concentrate on your timing. At 300 kts 2 minutes covers about 10 Nm so the other point of the inbound leg should be around DME 32 (if your IAF is at DME22) A 1 minute turn is a standard rate turn and at 300 kts you should bank 45° to make such a turn (refer to the BMS Comms and Nav book for proper holdings procedures and formulas) the Hornet HSI on the right shows arrival at the IAF after the holding entry.



Since it's your first time and since you're flying in the thick part of the weather, the planners have placed a PPT and a line to display (approximately) the IAF and the recovery axis on your DTC. It should be visible on your HSD. Do mind that the ship is moving though.

Be also on the lookout for the Charlie call of your flight lead. He holds 1000 feet below you and once given his Charlie call, he will depart the holding for platform. Once he departed the stack, you know you are the next in line and that may help you plan your final holding turn.

You will hear lead report platform (passing 5000 feet) and soon after the carrier approach will issue your own Charlie call.

"Spade 1-2 Charlie is now: BRC 145° – Bearing 160°"

Depending on your position in the holding, fly back to the IAF first. That will negate the difference between BRC and bearing. Ideally you want a bearing which is the same as BRC for a long straight in approach.

The above call was received as I was on the reciprocal leg of the holding. The bearing would be used in case you want to fly direct to the carrier, but don't do that. Terminate your holding (or cut short your straight leg but execute your 1-minute turn back to IAF so you leave Marshall to platform from the IAF where BRC = bearing.

Over the IAF at 7000 feet, start your descent with 4000 fpm and passing 5000 feet report platform on the ATC carrier page. The controller will the switch you to tower. Punch 265.2 or preset 8 in your UHF radio. No need to call them.

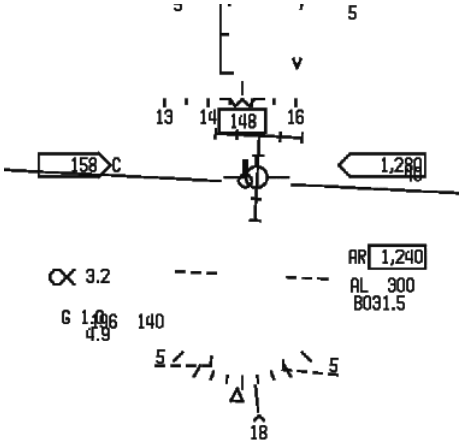
Decrease your rate of descend to 2000 fpm and plan to level out at 1200 feet. You have a rather long level flight at 1200 feet. Use that time to prepare your jet for landing.

- Decrease speed
- Lower hook
- Flaps Full
- Switch to ILS mode
- Lower your gear
- Eventually punch the auto-throttle once you have on speed AOA.

You should be all setup no later than 6 DME.
The ILS needles are displayed in your HUD and the Localizer is already active, the glideslope is still dashed and above you.

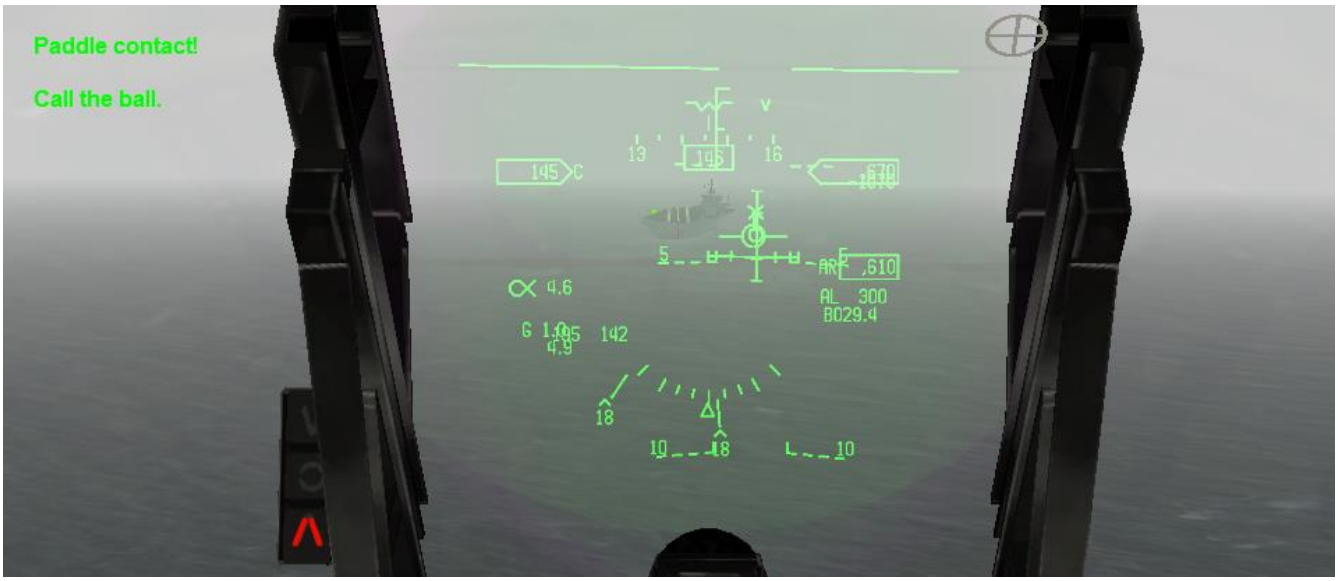
As always, we will intercept the glide from below by basically flying level and let it come to us.

The glideslope turned active and the flight directors is no able to guide you simultaneously on both axes as illustrated by the vertical line on top of the CATA circle.
The next thing to do is to fly the correct AOA on speed by making the AOA bracket descend on the FPM. A few knots will do.



Around 3 DME, the tower will call you for the first time and tell you to fly your needles referring to the ILS bars. The ILS bars will soon centre in the HUD, start your final descent.

The LSO will see you visual around 3 quarter of a mile and will request you to call the ball. Do so as usual with the carrier page of the ATC menu and concentrate on that final approach.



Soon after calling the ball, the LSO will state you're fast, you're high and aligned right. Correct as per LSO instructions until touch down.

Once on the deck, don't delay raising the hook and fold the wings, aircraft are landing behind you.
Park the jet, request chocks and enjoy a moment of pure satisfaction as you now perfectly understand the pressure level the number 3 and 4 you watch landing are feeling right now!

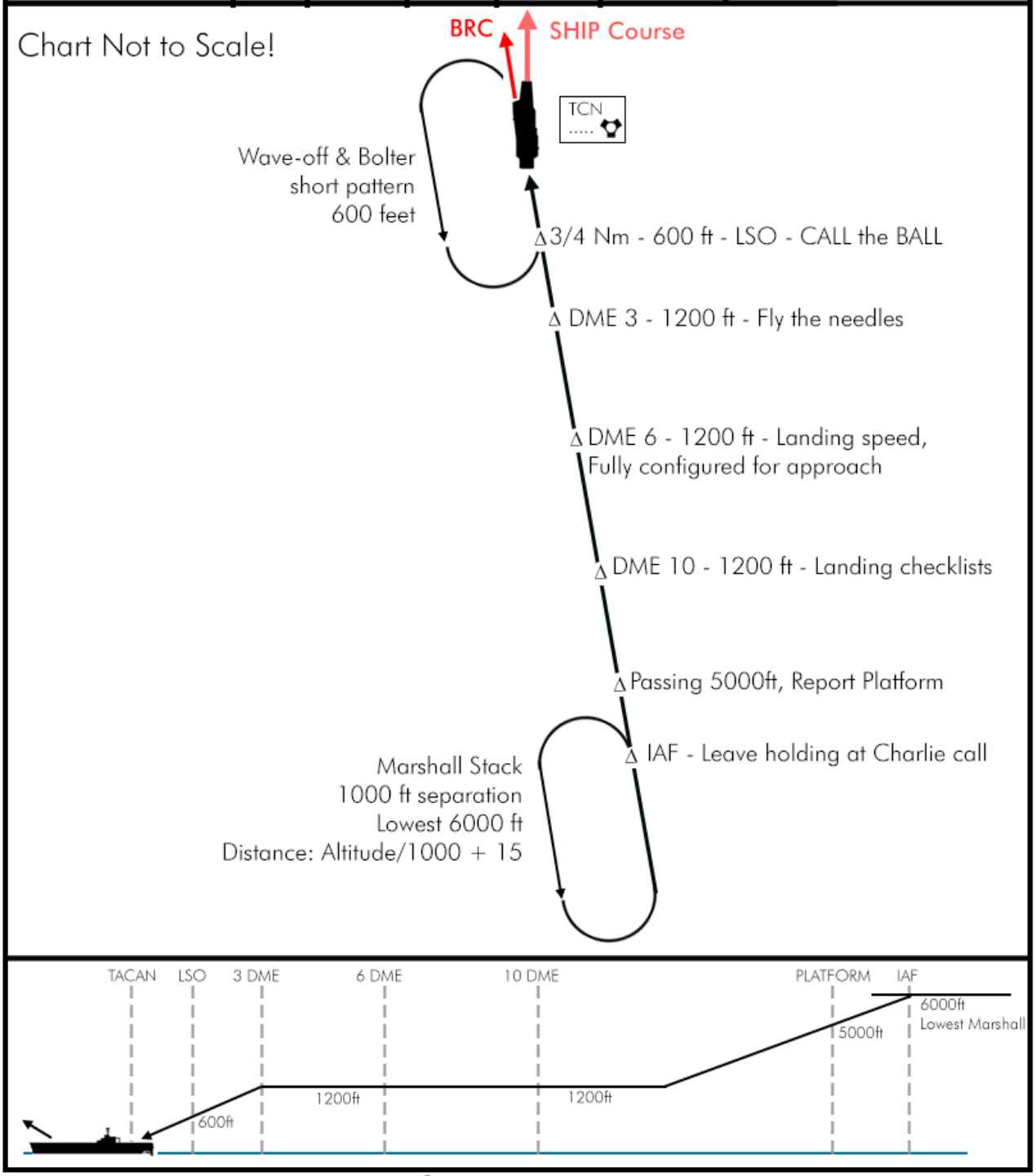
Well done, you're officially a BMS carrier pilot!

BMS NAVIGATION VOLUME

CARRIER CASE 3 RECOVERY

Date: 05 January 2019

CARRIERS:	TCN:	ILS:	GND:	TWR:	APP/DEP:
ENTREPRISE CVN-65	012X	108.55	265.3	265.2	265.1
C. VINSON CVN-70	010X	111.7	270.3	270.2	270.1
ROOSEVELT CVN-71	011X	110.1	271.3	271.2	271.1
TAKR KUZNETSOV	013X	111.1	363.3	363.2	363.1
LIAONING CV-16	014X	108.3	272.3	272.2	272.1



CARRIER CASE 3 RECOVERY

NOT FOR REAL NAVIGATION - FALCON 4 BMS ONLY

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7.4 MISSION 26: AV-8B+ V/STOL Operations.

PREAMBLE: This training mission assumes you are at least familiar with the basic operation of the AV-8B and its nozzle system. It is advised to assign the nozzle controls to your HOTAS as managing them with the mouse is hardly possible when performing vertical operations.

LOCATION: On the deck of USS WASP cruising off the North coast of Japan.

CONDITION: AV-8B+ – Single ship – Callsign Jump 7-1
GW: 24726bs – 2 AIM-9M – 2 BDU-59 LGTR – 1 LAU-68 rocket pod & 1 AN/AAQ-28 targeting pod
Max G: +5.5 / -2; Max airspeed: 550 KIAS / M0.95

WEATHER: FAIR, winds from the North, unlimited visibility, calm seas.

GOAL: Successfully trap the aircraft vertically.

The purpose of this training mission is to get you acquainted with the Harrier and operations from the LHD-1 USS WASP. If mastering carrier operations with the F/A-18 is complicated, mastering naval operations with vertical landing is even more complicated. Be ready to scrap a lot of metal trying vertical in the beginning. Do not worry that is why we have training missions.
The scenario for this training hop is quite versatile. The initial plan is to launch from the WASP performing a STO take-off, strike a ship, fly to MCAS Iwakuni and practise some vertical landings on the VTOL pads alongside the main runway and hotpit refuel the jet before coming back to the USS WASP and perform a vertical landing. The reason we fly to MCAS Iwakuni is to train vertical landing on a stationary spot as opposed to a moving spot on the WASP. But basically you can choose to bypass the hop to Iwakuni and try straight on the moving deck, or make a full stop at Iwakuni or even make a conventional landing on the long runway at the airbase.
You decide according to your own capabilities.

Select the AV-8B+ single ship, cross check the gross weight from the loadout screen and commit to taxi (you can commit to ramp if you prefer but ramping the Harrier is out of the scope of this document).
Your Harrier will be parked on the back of the WASP alongside another couple of AI AV-8B which will be launched before you.

Set your UHF radio to preset #2 (268.3) and listen for the initial contact from the other flight.
Once they are cleared to taxi and enroute to the fake catapult on spot #4, request taxi, remove the chocks and start gently taxiing forward aligning your jet with the tramline (the thick yellow line on the deck). Bear in mind the nose wheel of the Harrier is not as manoeuvrable as the one from the hornet, so be careful taxiing.
Your gross weight is above 25000Lbs so you need to start your STO procedure from as far back as possible on the deck. Shoot for Spot #7. Taxi forward to spot #6 to accommodate ATC only when your gross weight is around 23000 Lbs.

Once aligned with the Tramline, set your nozzles to 50° and set your flaps to STOL mode. Remain on Ground as you are not close enough to the fake catapult to be detected by the ATC for a switch to tower. This can only be done when you are lighter and can taxi to spot #6. You must thus launch without clearance which is better than launch in the water.
Hold the brakes (and your breath), increase RPM to 70%. Release brakes go full power and maintain directional control staying aligned with the tramline accelerating on the deck. (passing around spot #6, ground will switch you to tower ..., go on try that!) Reaching the end of the deck, you should see the airspeed scale on your HUD come alive. Target speed before leaving the deck is about 80 kts. With nozzles at 50% and your GW you should be flying when your wheels leave the deck. You have a 60 feet air buffer before going into the water.

-Don't stress the AOA to avoid stalling, retract the gear and fly straight ahead climbing to 600 feet.
Switch to Preset #4 and report airborne through the carrier page of the ATC menu. Although you didn't used tower, departure will provide proper instructions.
Once you have your altitude and airspeed under control, turn downwind and start your transition to jet borne flight by rotating gradually the nozzle back to horizontal (0°). Once the nozzles are horizontal, switch the flaps mode to CRUISE.

Iwakuni MCAS tacan is 126X so set your UFC T-ILS page to 126X and set your HSI to TCN mode. The HSI mode knob is just under the UFC on the left side. The tacan range should be around 100Nm so you should pick up its signal fairly rapidly depending on your altitude. If not Iwakuni is STPT #9. If you stay on preset #4 you will hear the returning Harrier flight contacting Wasp and you may even follow them on preset #3 to listen to their approach comms.

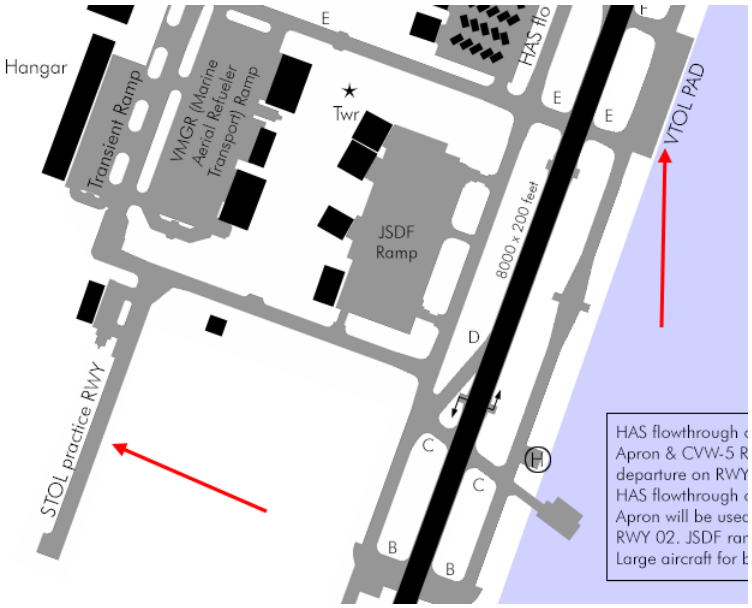
On your way to Iwakuni, just before going feet dry (STPT#7) you may encounter a cargo ship used as a training target. You have LGTR and the targeting pod and one rocket pod. Your laser code is set to 1688, you may drop a few practise bombs to make the flight to Iwakuni less boring. Set your bingo to 3500 to ensure you keep enough fuel to practise at Iwakuni.

Select AG master mode, Master ARM to ARM (which wrongly illuminates the air to ground master light in the cockpit). Set your laser page accordingly (code to 1688, combat and lasing time to 12 seconds) and switch the laser switch to arm.
The FCR in Sea mode will allow you to better find the target ship and the TGP will allow you to finetune your pass. If you cannot find the cargo ship with sea mode, that means the cargo is dead in the water and selecting GM mode will find it.

After having dropped your LGTRs, you may finish it off with the rockets. They fire all at once and the CCIP pipper is a bit misplaced. Make sure you fire just before the pipper hits the ship.

After having a little bit of fun, set your switches back to safe and head back to the Tacan signal and the new Iwakuni airbase on the south West of Japan. The airbase is a Marine Corps Air Station and features many training aids for Marine aircraft such as the Short take off runway (South West corner of the airbase) and the Vertical landing pads (along the eastern side of the main 02/20 runway).

We will mostly use the VTOL pad for training vertical landings in this scenario but be aware that you can land the Harrier conventionally on the main 02/20 runway as well if you let your fuel go too low while you train the vertical landing procedures.



Once 40Nm from the airbase, set your UHF radio to Iwakuni approach 331.4 and listen to ATIS on VHF: 128.4.
ATIS will report RWY 02 active with winds from the North East, Unlimited visibility and a few clouds at 5000.

Once inside 30 Nm, you may initiate contact with Iwakuni approach and request unrestricted approach.
Traffic is light around the airbase and they expect you.

Plan to overfly the airbase at 1500 feet coming from the North and enter right hand downwind for runway 02. The procedure to use the VTOL pads is to make a circuit as if you were landing on RWY 02, use the final approach to transition from jet borne flight to hover just abeam the pads and then transition to a 50 feet hover at taxiway Echo to land on the first vertical pad marking visible in the picture below.

Before overflying the airbase, set your flaps mode to STOL mode. Check your fuel and reset bingo level to 2000Lbs and quickly compute your gross weight to ensure you are below 26000, which should not be a problem here since you took off lighter than that.

The way to do that requires a bit of prior planning. When gross weight is such an important factor as it is for the AV-8B, you should zero the fuel slider on the UI arming screen and commit to memory the ZFW (zero fuel weight) In this case it was 16967 Lbs rounded to 17000 Lbs. If you did not drop any ordinance you can compute to actual GW at any time by simply adding your fuel totalizer number. In this case, if your total fuel overhead Iwakuni is 4.5, you know your GW is 17000 + 4500 = 21500 Lbs. Of course you may have released two LGTRs and a few rockets so your GW is even lower than that. That is not really important as it is better to be conservative and be a few pounds lighter rather than being heavier.

Once the airbase is behind you start your 200° heading turn to downwind. Slow down to 200 kts and start a shallow descent to 600 feet. At some point Iwakuni approach will switch you to tower (299.75) switch your UHF radio and request landing as usual. Tower will ask you to report final. Initiate your transition to slow flight. This is done by maintaining altitude and AOA but gradually rotating the nozzles back. Set 60° nozzles and lower the landing gear in downwind. Make your base turn at 5 DME from the tacan and once in final approach set nozzles to 80° and report final to the tower.

As your airspeed decreases your will lose the HUD airspeed tape. to overcome that select UFC LIST 6 (INS page) where your groundspeed is displayed. That will provide invaluable help for your hover. If you lose the FPM on the HUD, select DRIFT CO.
Overfly the runway threshold at 50 feet altitude and control your airspeed with your nozzles, if you are too fast, increase the nozzle to 90 or even 100°. if you start flying backward, decrease your nozzle to 80°. Maintain 50 feet above ground and be very gentle on AOA keeping the double green arrow centred on the AoA indexer left of the HUD.

Maintain a little bit of forward speed till the VTOL pads and hover abeam the first mark. Pick a visual cue on your left on any airbase landmark and translate to the right with a very gentle stick input till over the mark. Start your final descent with decreasing the throttle just a notch and monitor your descent planning for a 4-point landing (all 4 gears touching the ground simultaneously). In hover keep your thrust high and do only small variation. Any large change will either send you too high or crashing to the ground. Welcome to the ground.

If you cannot stabilize your hover, go around and try again. transition back to jet borne flight on runway heading by increasing airspeed and gradually rotating back the nozzle but keep them at 60° turn downwind and try again to transition to hover as explained above. If you hit bingo, reset your approach to a conventional landing on RWY 02.

Contact Iwakuni ground on 321.3 and taxi clear of the VTOL pads via Taxiway Foxtrot to the Marine Apron. Pick any of the flow through hangars and chock the aircraft. Extend your air to air refuel probe and request hotpit refuel through the ground page of the ATC menu. The hotpit refuel option in the comms menu will remain greyed out as long as you do not extend the AAR probe. Once requested, the hoptpit refuel cannot be stopped with the comms menu. But retracting the AAR probe does the trick.
So monitor the hotpit refuelling and once totalizer hits 6000, retract the probe. That should be more than enough for the return trip to the WASP and allow a vertical landing with a gross weight under 26000 Lbs. (17000+6000-fuel needed for flight < 26000 Lbs)

Once ready, contact ground again and request ready for departure, follow instructions to the runway and plan for a conventional take-off. Although Iwakuni RWY 02 has markings for a STO takeoff, these procedures from ground-based runway are not working the same way as from the deck of carriers. With nozzles at 50/60° you cannot lift the Harrier at 80 kts when you reach the end of the painted marks. You can perform a vertical take-off though if you prefer.
Once airborne transition to jetborne flight on runway heading, rotate your nozzle gradually to horizontal, set flaps to cruise mode and head back to the wasp after having reported airborne with Iwakuni departure (331.4)

WASP tacan is 15X so reset your tacan to that channel which obviously will help you find the ship back. Set bingo to 2500 Lbs and select UHF preset #4 for WASP approach. Once inside 30 Nm request "inbound Mother" to get BRC. Remember that since the USS WASP does not have an angled deck, BRC in this case equals to ship's course.
Wasp is case 1 so Marshal should be overhead the ship on BRC (022°) and since you are the only aircraft still in flight the stack will be at 2000 feet. Once visual with the ship report “see me” on the carrier radio and continue flying to the stack overhead the ship as explained earlier in this manual. Approach will switch you to tower preset #3 before getting there. Select Preset #3 for Tower but you don't have to contact them.

Tower will issue your Charlie call when you are holding above the ship at 2000 feet. It is important you make left turns in the holding. When you are given you Charlie signal, set flaps mode to STOL and leave the stack on BRC+210° = 022+210=232° descending to 800 feet and setup for your overhead break. This is done jetborne configured with nozzles horizontal, 800 feet 250 Kts. break left over the ship and report overhead break on the carrier ATC menu.
Descent to 600 feet for downwind, set nozzle to 60° and turn base as usual around the picket ship.

2-3 Nm from the ship on BRC, lower the nozzles to 80% and monitor your airspeed decreasing. LSO may report contact and ask you to call the ball. Do so if you want to hear LSO calls, but don't lower your hook as the LSO may request. Descend to 250 feet and shoot for a hover 50 feet (110 feet MSL) abeam spot #7 on the deck.

It's a slow process where you will have to constantly monitor your relative speed (look at the DED page) your nozzle angle (80° to advance slowly, 90° to slow down forward speed, 100° to slow down more aggressively or even fly backwards) and at all times maintaining precise and gentle throttle inputs to compensate and maintain hover.

It is not easy and practise is the key, so do not feel bad if you do not succeed from the first try. You always have the option to go around for another circuit and land just like the AI do, that is performing a conventional carrier approach on the 4 fake arrestor wires. If you do just do not forget to lower your hook and follow the LSO calls.

Frankly, I was not able to cope with the abeam position and lateral translation above the mark. And you can tell that by looking at the pictures in this chapter. With the unstable hover it is easier to plan your approach from straight astern with a shallow glide slope and land on your aiming point. It is not perfectly realist but I confess I was not able to master the real way while writing this chapter.

You are now on the back on the deck, taxi to a parking position and shut down the Jump jet. Well done.
And if you are too lazy to turn around, remember the Harrier can taxi backward with nozzle at 110°

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8. Glossary

AI:	Artificial Intelligence
Ball/Meatball:	The Fresnel lens situated left of the landing deck guiding pilot on the optimal glidepath.
Bolter:	A deck landing where the hook misses all 4 wires
BRC:	Base Recovery Course. In reality the ship course during aircraft operations. In BMS the heading of the landing deck during aircraft operations.
Case1:	Day VFR approach procedure
Case3:	IFR or Night approach procedure
Charlie:	A code word directing aircraft to start their approach procedure.
CTO:	Conventional Take-Off
CVN:	Nuclear Carrier
DME:	Distance Measuring Equipment
Groove:	Final approach
IAF:	Initial Approach Fix
ILS:	Instrument Landing System
JDB:	Jet Blast Deflector
LHD:	Landing Helicopter Dock (Assault ships)
LSO:	Landing Signal Officer
Marshal:	Callsign of the carrier approach frequency
MC:	Mission Commander
Mother:	Surname for the mother ship
MCAS:	Marine Corps Air Station
NWS:	Nose Wheel Steering
Paddle:	LSO surname, comes from the time where LSO were using paddles
Platform:	Report point on case 3 approach at 5000feet level
Pri-Fly:	Primary-Fly: callsign of the carrier tower frequency
RWR:	Radar Warning Receiver

Stack:	The holding location during the recovery procedures.
STO:	Short Take Off
TE:	Tactical Engagement
Trap:	landing on a carrier
VL:	Vertical Landing
V/STOL:	Vertical/Short Take Off & Landing
VTO:	Vertical Take-Off
Wave-off:	Directive call from the LSO to abort the approach and go around
WOW:	Weight on Wheels
WPT:	Waypoint

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