BMS NAVAL OPERATIONS

Version: BMS 4.37.3

Date: 12 May 2023

FOREWORD

PURPOSE AND SCOPE

This manual contains information on BMS Aircraft Carrier Operations. BMS implements naval operations features primarily the F/A-18 Hornet. Although the AV-8B Harrier, F-14 Tomcat and Su-33/J-15 Flanker-D are also flyable. The 4.34 and 4.35 releases added completely new Air Traffic Control (ATC) procedures for player-controlled aircraft and added another carrier group centred on the USS Wasp, LHD-1. Falcon BMS 4.37 carries on this dedication to realism with updated graphics based on DirectX 11.

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, Navigation, and Aerial Refuelling as these functions are common to both land-based and carrier-based operations.

All changes in this document coming with 4.37.0 are marked with a **black** line.

All changes in this document coming with 4.37.1 are marked with a **blue** line.

All changes in this document coming with 4.37.2 are marked with a **red** line.

All changes in this document coming with 4.37.3 are marked with a **green** line.

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1. INTRODUCTION

Although BMS is still very much an F-16 sim, and will always be, Naval Operations is considered an important asset in TE and campaign missions. Thus, to make Naval Operations more relevant for human players, Carrier Operations has been further developed to become more stable and enjoyable in the BMS environment.

Naval Operations has progressed steadily since BMS 4.33 with the introduction of new aircraft carrier models. BMS 4.34 further refined the naval operations with the addition of the Russian & Chinese Forces carriers and carrier borne aircraft, and implementation of naval-specific ATC procedures. BMS 4.35 implemented the LHD-1 WASP & Harriers for V/STOL, and ATC operations. now include Case I and Case III recoveries. With BMS 4.37 a wealth of graphical improvements has been added thanks to the introduction of a DirectX 11-based engine. Improved wingman and OPFOR AI, improvements in weaponry physics & guidance are all included in naval aircraft, but the most significant introduction to naval aviation is *Probe & Drogue Aerial Refuelling*. This adds a great deal of realism into the game as well as a great deal of challenge as taking on fuel is no longer reliant on holding a steady position while a highly trained, airborne "gas station attendant" pumps gas. Probe & Drogue refuelling is covered in the BMS Training Manual.

The US Navy *F/A-18C*, the USMC *AV-8B* and the VMF (Russian Navy) *Su-33* are at different levels of integration. (The PLANAF J-15 is also included, but it is simply a Su-33 Model with Chinese markings). The F/A-18C is by far the most complete aircraft for carrier ops in BMS. It features a fully dedicated 3D model and cockpit with all relevant carrier functions enabled.

The AV-8B is equally well developed. It features a full 3D model and cockpit, but most importantly, an accurate VSTOL flight model allowing the capability to take off and land vertically.

The Su-33 Flanker-D and its Chinese License built version, J-15, are the latest carrier-borne aircraft. At time of 4.37 release, only the new 3D model was completed, but the cockpit is still an F-16 cockpit. A dedicated Su-27 centric cockpit is in the works, but it isn't quite ready.

NOTE: All key bindings listed in this publication are in reference to the 4.37 BMS Full key file. Any personally modified or other key files may not have the same key bindings.

2. CARRIER-BORNE AIRCRAFT IN BMS

Falcon BMS has practically all carrier-borne aircraft currently in service with the US Navy, US Marine Corps, Russian Navy, and the Chinese People's Liberation Army Naval Air Force. Some that have yet to be mentioned is the E-2C Hawkeye, MH-60R Seahawk, and the Su-39 Frogfoot. As pretty as these jets look to date in 4.37, they are just that: *Eye-candy*, and nothing more. This should not preclude you from attempting to fly them, but just don't expect much. Also, helicopters are still only AI controlled, but it is kind of fun to watch them spool up next to the jet and watch them take off.

For us humans, the only carrier-borne aircraft available with an Advanced Flight Model (AFM) are:

- F/A-18C Hornet – fully implemented for carrier operation, 3D model & cockpit.
- AV-8B Harrier – fully implemented for carrier operation, 3D model & cockpit.
- Su-33 Flanker-D –Implemented back in 4.34 but still has an F-16 cockpit.
- F-14 Tomcat – 3D model but with an F-16 cockpit as well.
- MiG-29M – 3D model and old MiG-29A cockpit model with no specific carrier features.

2.1 F/A-18C Hornet

The Hornet has been constantly updated since BMS 2.0 and is the backbone of naval operations in BMS, just as it is in real life. Since BMS 4.33 the Hornet features a fully "ramp-start able" 3D cockpit for all legacy F/A-18's. (Refer to the PDF located in the *Docs\04 Other Aircraft\01 F-18* folder for more details). Reference the 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 (and one may expect that the E & F models can also be ramp-started, only with a C model cockpit).

Among the most obvious difference from the F-16 is that the Hornet does not have the -16's Fly-by-wire system, so the responsiveness of the jet will feel…" mushy" at first. Also, "mind-your-Alpha". The Hornet will constantly warn that you are pulling too hard on the stick, exceeding the AoA limits. Another difference which we take for granted in the Falcon is controlling flaps. In the Hornet there are 3 different settings for the flaps. Any of us remember the last time, outside of a damaged jet, we dealt with a "flap switch" in the -16? Me neither!

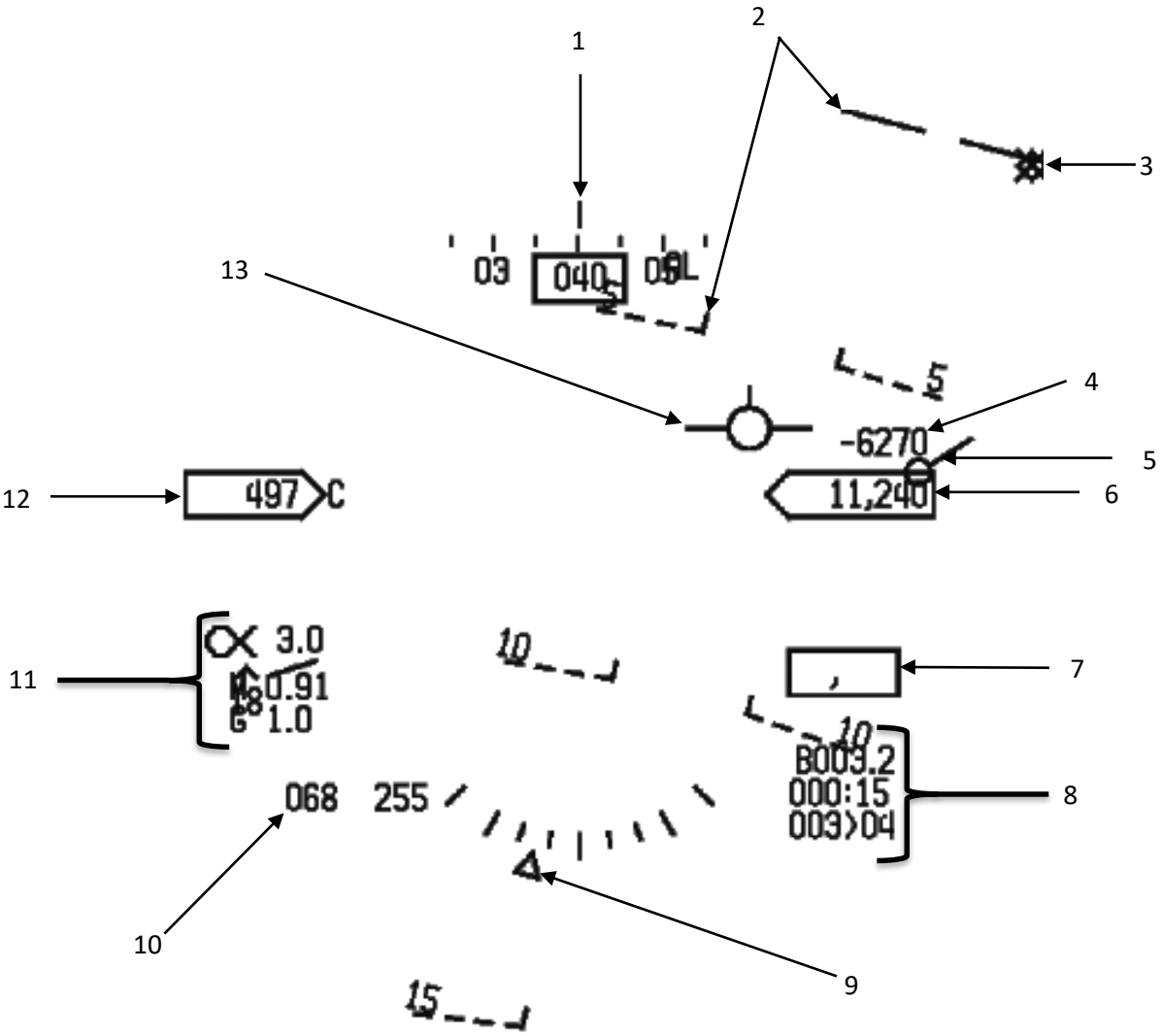
All of this translates into a slight increase in pilot workload inside the cockpit.

NAV HUD:

Some highlights of what's in the HUD. Reference figure next page.

NOTE:

- AoA landing bracket is set for 6°-10°. The alpha display will blank out with gear down and FPM is in the bracket range. Also, the cockpit AoA indicator lights will match the correct AoA range
- Peak G's 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.
- Radar Alt must be on for Altitude Above Ground to be displayed.
- A major difference is in the F-18's HUD is the display of RWR data superimposed over the flight data. It's a nuisance, at first, but you'll eventually get used to it.



1	Heading Tape	8	**STPT Data**	11	**Flight Regime Data**
2	Pitch Ladder		➢ Slant Range		➢ Angle of Attack
3	STPT Marker		➢ Time to STPT		➢ Mach Number
4	Rate of Climb/Decent		➢ Range/Selected STPT		➢ Current G-Force
5	STPT Tadpol	9	Bank Angle		➢ Peak G (not shown)
6	Barometric Altitude	10	Bullseye Reference	12	Airspeed
7	Radar Altitude			13	Flight Path Marker

Flaps

Like the F-16 the F/A-18 features automatic LEF (Leading edge flaps) and TEF (Trailing edge flaps). But unlike the F-16, there are three separate settings for the flaps. Normally AUTO and FULL are used throughout the flight.

Auto – (*SimTEFCMDAuto*) 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.

WARNING: Do Not use this setting for catapult launches! You most likely *will not* clear the water!

Half – (*SimTEFCMDHalf*) 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 folded, aileron droop is set to 0°.

Full – (*SimTEFCMDFull*) 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 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 folded, aileron droop is set to 0°. The default key assignment for setting flaps (*SimTEFCMDInc*) is *Shift F12* and (*SimTEFCMDDec)* is *Shift F11*.

Launch-bar Switch

The Launch Bar switch is located on the left auxiliary. Extend the Launch Bar (*SimLaunchBarEXTEND*) in order to hook up to the catapult. Otherwise, the aircraft will not stop at the shuttle and will continue right off the bow. Flip this switch up to retract (*SimLaunchBarRETRACT*). Note the switch is "Aviator Proof". The corresponding switch position relates to the launch bar position (E.G. Down = Extend, Up = Retract). The default key assignment for the launch-bar (*SimLaunchBarToggle*) is *Shift Ctrl Alt L.*

WARNING: After hooking up to the catapult shuttle and prior to launch, the Launch Bar *must* be retracted to allow proper retraction of the landing gear. Not doing so will not allow nose gear retraction and possible damage to the landing gear.

T/O-Trim Button

The T/O Trim button is in the center of the rudder trim knob on the FCS panel. (A little more than ½ way on the left console panel). With the Weight-on-Wheels (WOW) switch activated, press the button to set the control surfaces for Takeoff. The default key assignment (*SimF18FCSTOTrim*) is *Shift Ctrl Alt T.*

WARNING: Be sure to include this step in the pre-launch checklist! With it set, you are guaranteed a positive rate-of-climb off the catapult. Without it, hope for strong winds off the bow!

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 is down, and airspeed is below 250 KCAS.

Pitch-Trim

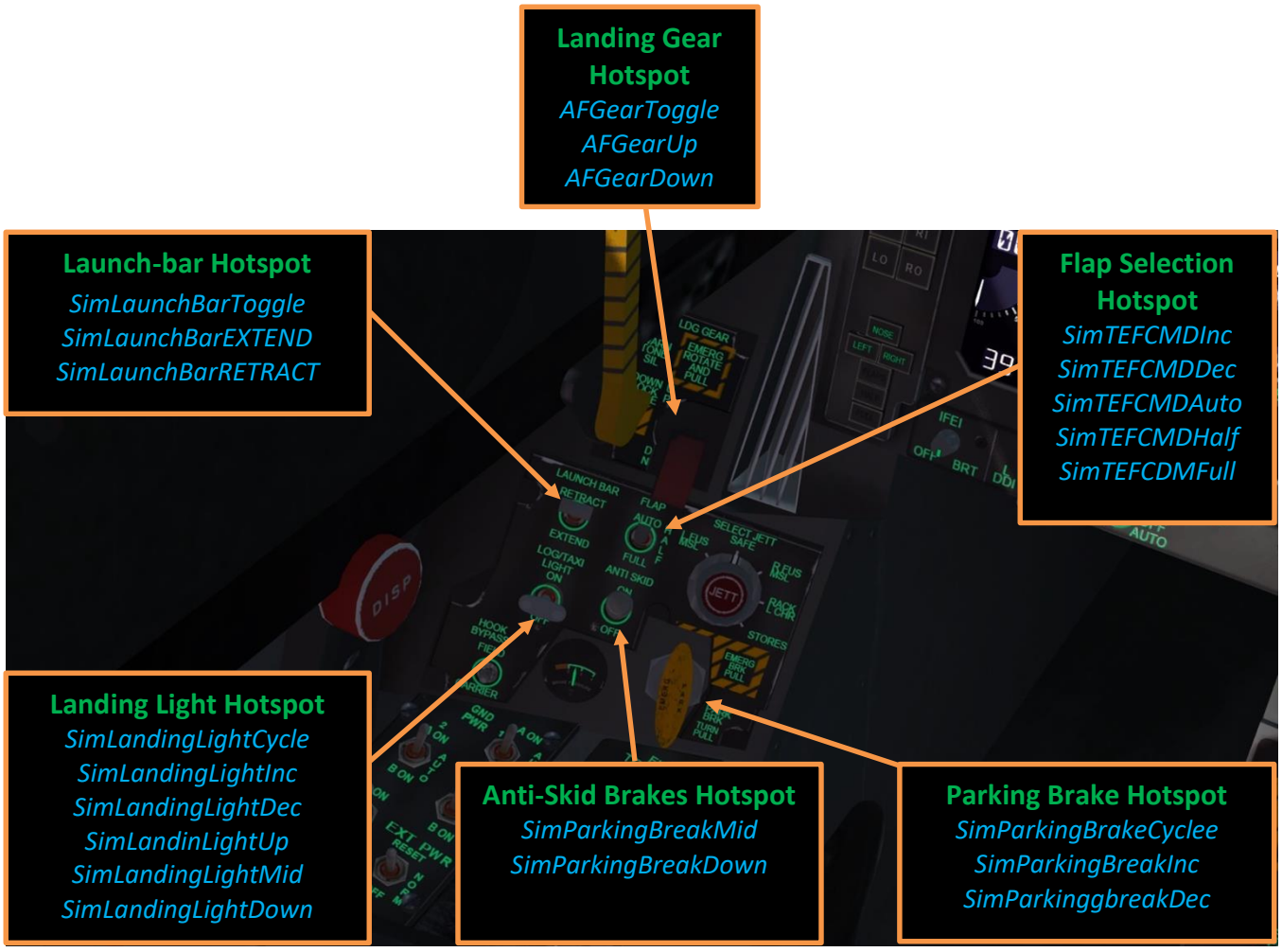
The optimal approach AOA for the F/A-18C/D is 8.1°, which corresponds to the center of the E-bracket symbology on the HUD (and the orange circle on the indexer). With the landing gear and flaps extended, and airspeed below 250 knots, the Hornet's FCS will attempt to adjust pitch to control AOA. The initial target AOA trim value is established when moving the FLAP switch from AUTO to either HALF or FULL position -- this target AOA can be fine-tuned using the pitch-trim controls on your HOTAS or key-bindings, but only within a narrow range -- so it's important to engage the flaps when flying close to the optimal 8.1° approach AOA. (See also: auto-throttle approach-mode, below.)

NWS

The Nose Wheel Steering (*SimMissileStep*) is modelled nearly identical to the F-16 and is activated with the keystroke *Shift-/*. (If using either the TM Cougar or TM Warthog, NWS is the same button in both aircraft). But, to allow for carrier operations the NWS of the Hornet has twice the rate of the F-16 NWS.

CAUTION: The higher rate of turn of the Hornet NWS is much more significant than the F-16. It is recommended to taxi slow and "learn the aircraft" on land first.


T/O Trim Hotspot
SimF18FCSTOTrim


Landing Gear Hotspot
AFGearToggle
AFGearUp
AFGearDown
Launch-bar Hotspot
SimLaunchBarToggle
SimLaunchBarEXTEND
SimLaunchBarRETRACT
Flap Selection Hotspot
SimTEFCMDInc
SimTEFCMDDec
SimTEFCMDAuto
SimTEFCMDHalf
SimTEFCDMFull
Landing Light Hotspot
SimLandingLightCycle
SimLandingLightInc
SimLandingLightDec
SimLandinLightUp
SimLandingLightMid
SimLandingLightDown
Anti-Skid Brakes Hotspot
SimParkingBreakMid
SimParkingBreakDown
Parking Brake Hotspot
SimParkingBrakeCyclee
SimParkingBreakInc
SimParkinggbreakDec

Wing fold

The wings are folded & unfolded (*AFWingFoldToggle; AFWingFoldUp & AFWingFoldDown)* using either the cockpit lever on the right aux console or by keystroke *Shift W*.

Tail-Hook

The tail-hook is just as important as the landing gear. A good technique is to lower the tail-hook once at Marshal. That way it is one less checklist item to remember when performing all the other flight duties. Raise and lower the tail-hook (*SimHookToggle; SimHookUp & SimHookDown)* using either the cockpit or lever on the right aux console panel (co-located with the wing fold lever) or by the keystroke *Ctrl K*.

Auto-throttle (F/A-18 only)

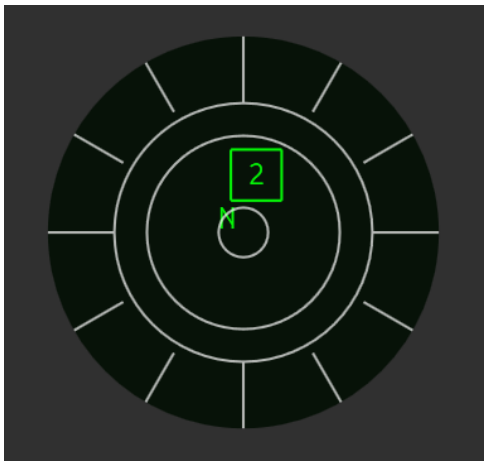
The Automatic Throttle Control (ATC, or just auto-throttle so as to not confuse it with air traffic control) is a two-mode system that automatically maintains angle of attack (approach mode) or airspeed (cruise mode). There is no cockpit hotspot for the auto-throttle. In the real jet the button is located on front side of the left throttle. The default key assignment for the auto-throttle (***SimF18ThrottleATC***) is *Shift Ctrl Alt A.*

ATC APPROACH Mode – With the FLAP switch set to HALF or FULL, the throttle is manipulated mechanically to maintain the desired approach AOA (see Pitch-Trim, above) which was established when the flaps were extended, and fine-tuned by pitch-trim controls.

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.

AN/ALR-67(v)3 RWR (F/A-18 Only)

The AN/ALR67(v)3 RWR used in 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. Direction-finding accuracy of E through K band (2 to 40 GHz) is 15°. C and D bands are omnidirectional



System runs periodical self-tests in background. Or the pilot can initiate manual Self-Test.

No.	FUNCTION	Key Binding	Description
1	ENABLE OFFSET	Alt + Num 9	Select highest priority target for composite audio, held for selection browsing
2	ENABLE SPECIAL	Alt + Num 3	Separates overlapping contacts on scope
3	LIMIT DISPLAY	Alt + Num 6	Selects priority mode
4	POWER Button	Alt + Num 0	Powers the system

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 will not increase G.

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

- Max load factor in subsonic when GW < 32357 Lbs is 7.5 G's.
- Between 32357 & 44 000 Lbs, Max load factor in subsonic is linearly scaled between 7.5 and 5.5 G's
- Above 44,000 pounds gross weight, the positive symmetrical command limit is fixed at 5.5 G's.
- Below 44,000 pounds gross weight, the positive symmetrical command limit is calculated based on fuel state and stores loading.
- In transonic region (Mach 0.9 to 1.1), G is limited to 5 G's.

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

NOTE: 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%: thus, if the current G limit is 5.5, using the paddle G limit increase to about 7.3 G. If the G limit is 7.5 G's, using the paddle will allow up to 10 G's.

Exterior Lights

Despite the missing position lights dial, new callbacks for the exterior lighting have been added. Currently three controls are implemented. But they are meant for use in the Viper and do not necessarily translate to the dials & switches in the Hornet.

Formation Lights – Green formation lights (or also known as "Slime lights") are fully implemented. Use ***Shift X*** to dial their brightness up (*SimStepFormationLightsUp*) and *Shift Z* to dial them down (*SimStepFormationLightsDown*).

Position Lights – Due to the simplicity of the Hornet's light panel compared to the Viper's new panel, the position lights can only be adjusted with [*SimExtlSteady*] either *Shift+Ctrl I*.

Anti-collision Lights – Same as with the position lights, the Hornet's anti-collision lights can only be turned on or off with toggling *Shift+Ctrl U* (*SimExtlAntiCol*). On & Off may be mapped with [*SimAntiCollOff*] & [*SimAntiCollOff*].

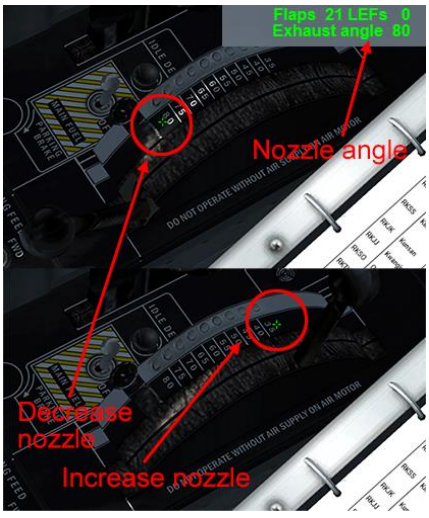
2.2 AV-8B & AV-8B+ Harrier

This manual concentrates 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 BMS User Manual chapter 7.3.5 covers the basics for mastering the Harrier in BMS. Do not hesitate to refer to it while reading about Naval Operations.

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 and Short Take-Off (STO) operations from WASP is 25-26000 Lbs. If the GW is up to 23000 Lbs position #6 may be used to begin the take-off from to accommodate ATC. Any higher GW, start as far back as possible.

There may be times when sacrificing weapons or fuel is required to take off. If the choice is *less fuel,* ensure to be proficient in probe & drogue refuelling. This is a new addition to 4.36. Enjoy!



Maximum Landing weight is 26000 Lbs.

Specific controls for shipborne operations are obviously the nozzle rotation angle and the two flap modes.

Nozzle rotation is possible with either callbacks or hotspots and are incremented by 10° from 0° (horizontal) to 120° (max rearwards rotation) – 90° being vertical. The hotspots are identified in the figure to the right. Please note the cockpit graduations are reversed and the correct nozzle angle indicator is on the top right corner of the 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.

2.3 F-14 Tomcat

The F-14 Tomcat is available in four different liveries: F-14A, B, D & an Aggressor variant. While in 4.35 it did feature a very crude cockpit, that has been replaced by an F-16 cockpit, with the expectation to be replaced someday (3-4 weeks, BMS time) with a much more complete F-14 cockpit. Although flyable by the user the current implementation really does not make it relevant for use by human flyers, and it is best left for the AI. Which is a real shame since the model is gorgeous.

2.4 Su-33 (Russia) & J-15 (Chinese) – Flanker-D

The Su-33 and its Chinese-made version, the J-15 (picture right), have gorgeous new 3D models, with dedicated flight models. Unfortunately, a decent cockpit was not completed by 4.37's release, and they both fly with an F-16 cockpit.

NOTE: The F-16 cockpit does not have any switches to unfold/fold the wings, so be sure to assign a key binding to unfold the wings.

NOTE: The SU-33/J-15 AoA is limited. This AoA limiter may be deactivated by using the paddle override switch (E.G. Thrustmaster's HOTAS paddled switch).

AoA LIMITS: The limiter is depending on gross weight (GW) & Mach:

- If below Mach 0.85 & GW 435894 lbs: G limit = 9G's
- If between Mach .085 – 1.25 & GW 354323 lbs: G limit = 7G's
- If above Mach is above 1.25 & GW 382363 lbs: G limit = 7.5's

2.5 MiG-29M

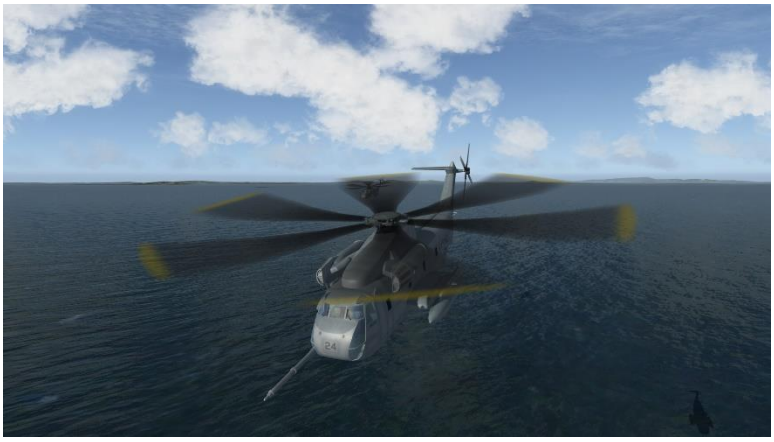
The MiG-29M (Fulcrum-E) in the database is the navalized version of the Fulcrum. The MiG-29 has a nice 3D model and a dedicated but old cockpit. The aircraft does not have specific carrier feature like wing folds or a visible hook (you will still trap on the carrier), but the Russian carrier does not launch aircraft via catapult anyway, thus it is not inconceivable for a human-controlled MiG-29.

2.6 Su-39 Frogfoot

One last Russian aircraft available in the BMS database is the Su-39. The Su-39 has no naval features, a decent 3D model and the cockpit defaults to the F-16. *Let AI only fly it*.

2.7 Other Aircraft

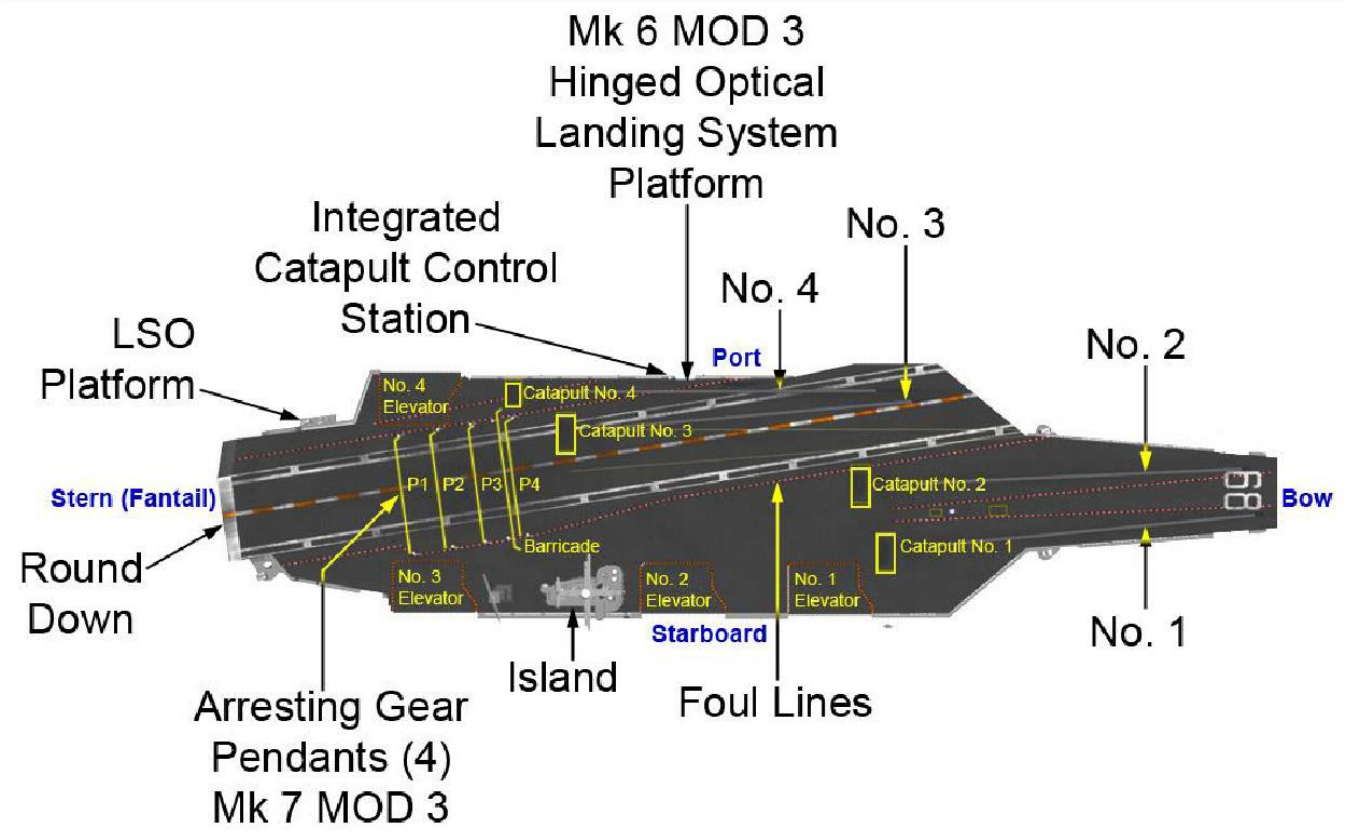
There is a wide variety of other naval aircraft. All are flyable (except helicopters), but not as accurately modelled as what is mentioned here. Rather they are included to make up an accurate depiction of what is currently in the inventory and add to overall force structure of game play. They are modelled with accurate AI skills and can be of great assistance in the combat-sim environment. So, add them into packages where they will be of the greatest advantage in a scenario.



3. AIRCRAFT CARRIERS

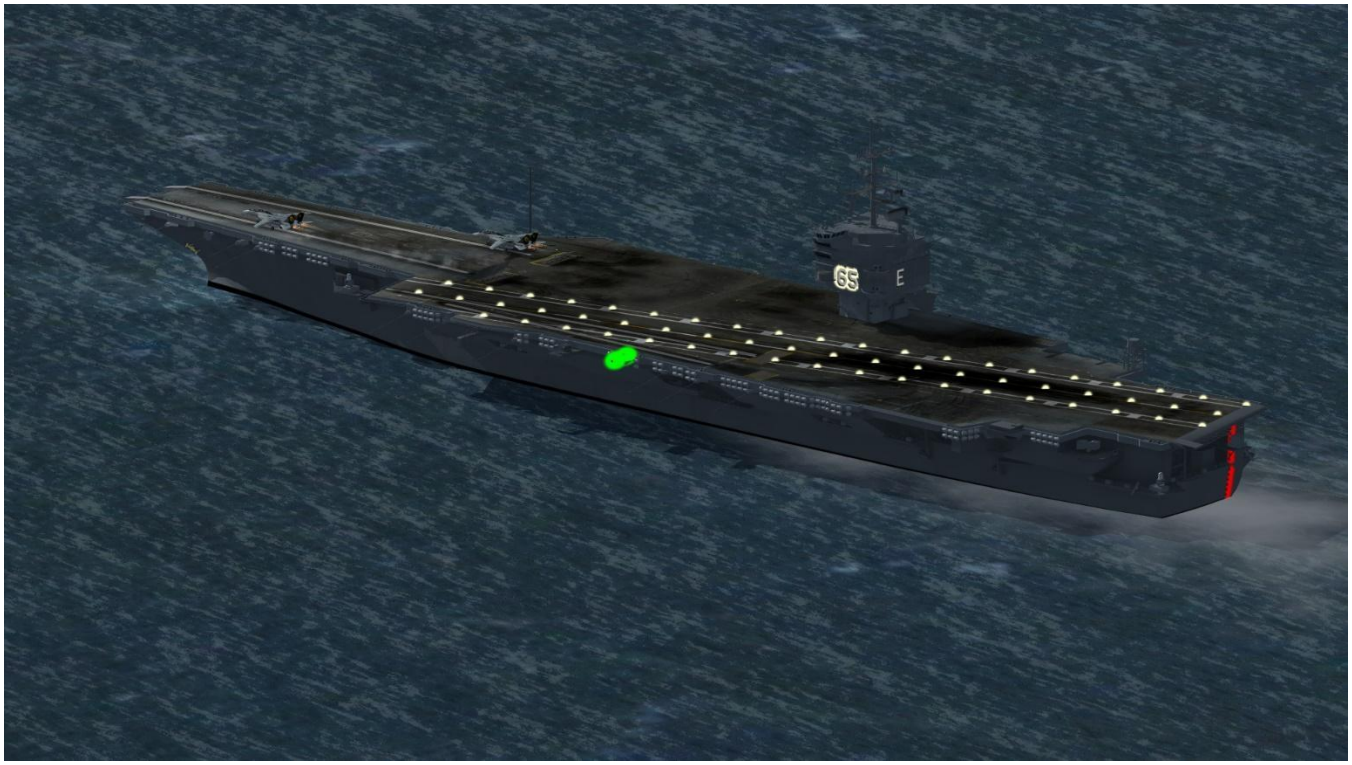
Falcon BMS features a total of 6 aircraft carriers. Three US Navy super carriers, one US Navy LHD, and the Russian & Chinese carriers. The US Navy's carriers are complete with 4 working catapults, 4 arrestor wires and a working optical landing system (aka "Meatball"). The Russian and Chinese carriers do not use catapults, instead have 3 "launch positions" off the bow, and 4 arrestor wires plus the optical landing system. The USS Wasp is a Landing Helicopter Dock, or LHD. It does not possess any of the above for use by human pilots and is for all intent & purpose a platform to land on in the open ocean.

Refer to the figure below for basic deck nomenclature.



The Russian & Chinese carriers are considerably different, but the basic layout is still relatable.

- **3 US NAVY SUPER CARRIERS**



CVN65 USS Enterprise

CVN70 USS Carl Vinson

CVN 71 USS Theodore Roosevelt

- **1 US NAVY LANDING SHIP:**

LHD-1 USS WASP – The USS WASP is not considered an aircraft carrier but does accommodate the AV-8B and helicopters.

- **1 RUSSIAN NAVY CARRIER**

TAVKR Kuznetsov

- **1 CHINESE NAVY CARRIER**

PLANAF Liaoning

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, the briefing page, or the Weapons Delivery Planner app.

The carriers have the following radio channel assignments:

HULL No.	CARRIER NAME	TCN	ILS	APPROACH	TOWER/LSO	GROUND
CVN-65	USS ENTERPRISE	012X	108.55	265.100	265.200	265.300
CVN-70	USS VINSON	010X	111.7	270.100	270.200	270.300
CVN-71	USS ROOSEVELT	011X	110.1	271.100	271.200	271.300
LHD-1	USS WASP	015X	111.8	268.100	268.200	268.300
LHD-2	USS WASP	016X	111.85	369.100	369.200	369.300
CV-63	TAKR KUZNETSOV	013X	111.1	363.100	363.200	363.300
CV-16	CNS LIAONING	014X	108.3	272.100	272.200	272.300

Note the mnemo-technique to *remember* these frequencies. They are sequenced through the carrier's ID number and their logical use for recovery. As an example, USS Enterprise, *CVN 65's*, UHF-frequency prefix is *265*, and suffix is in the logical order of arrival:

- *265.100* – Approach
- *265.200* – Tower/LSO (Landing Signal Officer),
- *265.300* – Ground.

Unfortunately, the US LHD and red-force carriers do not follow the same logic with the beginning digits.

4. AIRCRAFT OPERATIONS

Naval operations is a different world all together. Flight operations in the US Navy is no exception. Besides the obvious differences between land and water, there are considerable deviations in the brevity used. A general technique is, remember that BMS' is code is mostly the same across all flight operations. Taxiing, take-off, departure, cruise, approach, land, and taxiing is essentially the same either in an air force jet or a navy jet. With this in mind, during any stage of flight, it *should* all fall into place.

AI Helicopters are also able to operate from landing ships and carriers.

(*HINT*: MC does give the ability to add a helicopter squadron to the carrier group or LHD task force. This may be an asset to any TE or campaign. It may or may not improve chances of rescue during those times you fail to recover back on the deck, but it does add to the realism of the game).

Some of the naval brevity to be cognisant of:

- *Mother* is brevity for the carrier.
- *Marshal,* according to US Navy Operations manual NAVAIR 00-80T-105, is defined as: *"A bearing, distance and altitude fix designated by [ATC] from which pilots will orient holding and from which initial approach will commence"*. OR a simpler definition is generally the area where aircraft hold in preparation for approach.
- *Charlie* is a signal (clearance) for aircraft to land.
- *Platform* is a point in the approach pattern, at 5000 feet MSL, at which all aircraft will decrease their rate-of-descent to not more than 2000 feet per minute and continue let-down to a 10 NM DME fix. This will be most important during instrument approaches.
- *PriFly* is Navy "slang" for the tower.
- *Paddles* is the Landing Signal Officer (*LSO*). (Can also be considered as tower during the recovery phase).

This is just a taste of what to expect. There are other brevity words that will be covered later.

The carriers continue to sail in both solo and multiplayer games. When launching or recovering aircraft the carrier will always turn into the wind. Dedicated shipborne AI aircraft will perform launches (catapult or ski jump) and all implemented recovery types (Case I & Case III) including bolters and wave-offs.

As stated previously precise flying is key! If not, it could mean crashing in the open ocean and the *simulated pilot* tragically lost-at-sea. But in all reality, not flying precisely, simply means that a certain step in the ATC code will not execute, and thus not receive direction from ATC. *Do not let this* be *discouragement!* The aircraft's INS will always know where the carrier is so getting lost, like *Flight 19*, is rare! (Unless the INS is bent! Kudos to those who get the historic refence). While becoming proficient in carrier launches and recoveries, feel free to disregard the precision flying and ATC calls, and just practice going through the motions. Start off with touch & go's or landing at an airbase. In the grand picture of the game, if unable recover safely on the deck, without bending the jet, or the carrier, ignoring AI commands is the least of any concern. Which brings a very important lesson:

CAUTION: Crashing on the deck can *sink* the carrier. In a campaign, this can be catastrophic for allied forces (not to mention embarrassing for you). So, when in doubt, *Go-Around*!

As in US Navy operations, BMS categorizes launches and recoveries as *Cases*. Case I and Case III recoveries are fully implemented in BMS. *Case II is not*. The Case simply represents the current time-of-day & weather conditions. The three cases represent these various conditions.

CASE I is a VMC recovery. This is, for the most part, just an Overhead style approach.

CASE II – (Not Implemented) IFR conditions but clear enough below the clouds to make a visual approach. In real life, it is a combination of Case I & III, where aircraft must descend through the weather for part of the holding. A type of "clear-on-bottom" VFR approach.

CASE III is an ILS approach with dedicated holding and aircraft separation procedures. When this type of recovery is expected be ready with the TACAN & ILS frequency of the carrier. This info can be found in Chapter 3. Case III recovery can be expected in the following conditions in BMS:

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

4.1 Deck Operations

Selecting the *TAKEOFF* option is no longer possible for a carrier departure; only *RAMP* or *TAXI* options are available. *TAXI* starts on the deck at the parking spot with the jet ready to go. RAMP begins 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 US Navy carriers. On the Russian and Chinese carriers, only three launch pads are available: Two on the bow and one on the waist and all launch off the bow. However, in both cases AI aircraft will only use the two bow catapults.

Flight and Element leads will take the forward port (left side, after all this is a naval document) catapult, No. 2, and their respective wingman the starboard catapult, No. 1.

Although the chocks are still referenced in the ATC messages, in naval operations, chocks are represented as chains. *Do not forget* to remove them prior to requesting taxi. You will begin the flight by going *nowhere fast*! When ready to taxi the process is the same as any air base: *Request ATC clearance for departure on the ground frequency through the ATC Ground page, be handed off to the "tower" for clearance to hook-up and launch.*

The carrier will always turn into the wind during aircraft operations. If the carrier is not presently sailing into the wind at the point of entering the 'pit, it will begin a turn. The takeoff time may be delayed while the carrier repositions. This may also create havoc with the other ships in the task force formation, and seeing a destroyer crossing the bow, or even through the carrier deck, is not uncommon. But it is of no concern as a naval aviator, nor can anything be done about it. (You're not at the helm!)

It is standard for carrier aircraft to taxi with their wings folded (if featured) and unfold them wings just before launch. This is done with the wing fold & unfold callback (AFWingFoldToggle) assigned by default to *Shift W*.

Depending on the take-off time and number in que, PriFly (Tower) may instruct to hold short. If given the "Hold Short" instruction, take a position behind the Jet Blast Deflectors.

The taxi procedure is the same on Russian and Chinese carriers (sans catapult). Refer to chapter 5.2.3 for LHD taxi operations.

4.2 Launching Procedures

4.2.1 Catapult Operation (US Navy carriers)

Before getting into launch position, check that the aircraft is ready.
NOTE: These steps are primarily for the Hornet, but can apply to all:

- ✓ Launch bar is in down position (*Shift Ctrl Alt L*)
- ✓ Wings are unfolded (*Shift W* (toggle))
- ✓ Take off trim is set (*Shift Ctrl Alt T*)
- ✓ Flaps are at either *Half* or *Full* (*Shift F12 & Shift F11*)

(NOTE: If the aircraft is light, feel free to use Half Flaps. But Full Flaps is always the safer bet.)

After clearance is granted from the Tower, carefully line-up with the catapult, and ease into position. It is quite evident when the aircraft's launch-bar hooks-up with the catapult shuttle: It will stop the forward movement and the nose dips slightly. Since there is no physical catapult shuttle on the carrier to view it is a bit difficult to know where the jet will hook-up. The best practice is use references on the carrier's deck to know where the jet is likely to hook-up. (Refer to figures). For catapults 1 & 2, a good reference is placing the pole on the starboard side, at approximately the 3 O'clock position. Another good reference (only for catapult 2) is a pair of fire hose reals on the port side. Placing the pair in the left corner of the canopy frame is a good indicator of where the hook-up will occur.

For the waist catapults (No.'s 3 & 4) these references tend to work to indicate where the shuttle is.

Once in position the Jet Blast Deflector will rise automatically.

NOTE: *If hook-up does not occur*, perform a U-turn on the bow taxi beyond the blast doors and try again. If on the waist catapults make a left U-turn, taxi back and try again. Keep in mind, the AI only uses the No. 1 & 2 catapults, and if flying a campaign mission, with a lot of aircraft waiting their turn on the cat's, it may be difficult to taxi around, so it is a good technique to practice in a TE and hook-up the first try before learning in the campaign environment.

Place the launch-bar switch in the *Retract* position. It's mechanically locked to the shuttle, and once launched, and free from the shuttle, it will spring back to the up position and will not fowl the landing gear.

CAUTION: Do not forget to raise the launch bar once attached to the catapult. Failure to do so will leave the launch bar in the down position after launch, preventing the nose gear from fully retracting after takeoff and possibly damaging the landing gear.

When ready to launch, PriFly will clear the flight for takeoff just as land base ATC (E.G., "HORNET 1, WINDS 270 AT 10 KNOTS, YOU ARE CLEARED FOR TAKEOFF"). At this point throttle up to full afterburner. As thrust is established the AI catapult chief allows steam pressure to build up in the catapult. The only indication is "*[GROUND] GET READY FOR TAKE OFF*" in the upper right-hand corner. A good rule-of-thumb is once at full afterburner, count "One-Potato, Two-Potato, Three-Potato…" sometime between three & five potato the steam pressure is sufficient, and the aircraft is be sent down the catapult.

NOTE: Other than throttling up to, humans *do not* control or trigger the exact launch time, nor will there be any warning. Expect the jet to launch within 5 seconds of going to full afterburner.

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

- Wings are folded
- Carrier is not into the wind
- The deck is pitching down
- The engines are not at full power

As with a real catapult, the game code adjusts steam pressure to the aircraft's weight. So having sufficient speed at the end of the catapult will never be an issue. It is recommended to maintain afterburner until 250-300 KCAS. Ensure flaps are set properly. The main causal factor of "going swimming" off the cat is generally an issue of *lift*.

NOTE: If the need arises to unhook from the catapult the default key is *Shift K.* (*AFTriggerCatapult* 'CKPIT: NAVOPS - Release Catapult Trigger').

4.2.2 Ski-Jump Operations (Chinese & Russian carriers)

Unlike the high-priced nuclear super carriers of the US Navy, with their fancy steam catapults, the Russian and Chinese carriers rely on the brute force of their jet's engines. This limits the takeoff weight considerably but does nothing to limit the stress of getting 30 tons of aircraft pass stall speed.

NOTE: It highly recommended to become proficient in Probe & Drogue aerial refueling, and plan Red-Air sorties with just enough fuel to take-off and make it to a tanker (Or plan a stop off at an airbase). This will increase the weapon's loadout and give enough room for error to successfully launch from these types of carriers.

Once clearance has been obtained from tower spread the wings (for the Su-33 – the MiG-29 model although navalized doesn't support wing fold) and taxi forward past the jet blast deflectors. Aligned with the yellow launch line painted on the deck. Wheel blocks keep the aircraft in place while at full power. Once these wheel blocks retract into the deck, the aircraft is launched.

Once past the Jet Blast Deflector, the two large red wheel blocks will raise from the deck just in front of the main gear stopping the aircraft. Perform any final checks and once ready, spool up the engines to full MIL power or afterburner (the Su-39 does not have afterburner). As with the US carriers, launch will be automatic from this point.

NOTE: Human's do not control or trigger the exact launch time. Expect to be catapulted within 5 seconds after going to full MIL or afterburner.

NOTE: 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

NOTE: If the need arises to unhook from the catapult the default key is *Shift K.* (*AFTriggerCatapult* 'CKPIT: NAVOPS - Release Catapult Trigger').

4.3 Departure Procedures

4.3.1 Case I Departure

There really isn't much to departures. Once off the catapult PriFly will simply give a heading and clear to proceed on course, just as on a land base. But for those who are by-the-book, the *official* procedures are as follows:

Case I 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. (NOTE: This left clearing turn is only valid for human players. The AI will never take the waist catapults).

Per US Navy regulations: After a clearing turn, proceed straight ahead paralleling the carrier's heading at 500 feet until 7 NM. Aircraft are then cleared to climb unrestricted in visual conditions. The altitude restriction is obviously to provide separation with possible aircraft in the landing pattern (floor at 600 feet). Since BMS is not coded for this, contact Mother giving an airborne call and proceed on course while maintaining good SA for aircraft in the pattern.

CAUTION: BMS code does not provide any safety feature for deconfliction from AI during launches.

For Russian and Chinese carriers, the departure procedure is the same, but all clearing turns are to the right since the Kuznetsov and the Liaoning do not have waist catapults.

4.3.2 Case III Departure

Case III departures are IMC departures. The BMS code does not plan anything particular for IFR departure from the carrier. In real life PriFly will space departing aircraft further away from one another, but this is not coded (yet) in BMS. For deconfliction purposes, such departure from the human perspective, is flown on the departure frequency with a controlled climb in IMC maintaining 300 KCAS until reaching 5NM from the carrier up to 1500 feet. From there the flight may proceed on course.

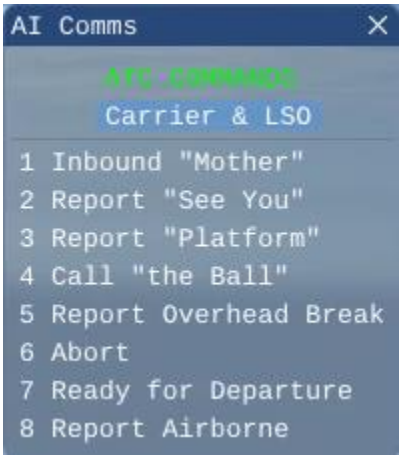
4.4 Recovery Procedures

As mentioned previously, to perform a proper recovery, precise flying abilities is a must. The secret to success is simply, *listen carefully to "Mother"* and *follow her directions exactly*. That is to say, stay on the proper altitude and DME to the carrier throughout the sequence. There are a couple reasons for this. One *being Navy pilots are supposed to be better than Air Force pilots*…so yeah. The second, and more importantly, is the game's code requires such precision to execute ATC comm's. The US Navy has developed very rigid procedures to provide a *safe, efficient, and deconflicted* airspace for a very small and moving runway. The result is an acutely accurate airspace where it is expected to be at the given place & time and get back on the deck without haste! And in keeping with BMS tradition, carrier operations is coded very close to standard US Navy operations. So, listen to Mother carefully, and *do not fowl the deck sailor*!

To contact the ATC for recovery, Approach (Mother) or Tower (Paddles), use the dedicated Carrier page of the ATC menu. Do not use the regular Tower or Approach pages as normal land base approaches.

NOTE: There is no separate carrier approach and carrier tower page, they share the same *Carrier & LSO* page within the usual ATC menu opened with the "*T*" key.

The initial radio contact with the ATC Controller, is on the carrier approach frequency. Once at 30 NM call *Inbound "Mother"*. *Mother* will give the anticipated Case recovery and any other general information such as weather conditions, assigned altitude and Base Recovery Course (BRC).



BRC is used frequently in carrier operations. It is essentially the same as the landing runway for an airbase. Since the "runway" is always moving through 360°, depending on the wind direction, BRC is used in lieu of a land base's runway heading. However, in BMS it is coded a bit differently than in real life. The *RL BRC* is the heading of the carrier's magnetic course. For-real "high-speed" Naval Aviators, they must do the "public math" by subtracting the 10° of the angled deck from the carrier's heading to determine what the landing heading will be. In BMS, this math is performed already, so simply expect BRC to be the landing heading (give or take a few degrees).

NOTE: The LHD does not have an angled deck, so BRC equals the ship's course.

4.4.1 Case I Recovery

Case I recovery is simply a VFR overhead-style approach. It is separated in 3 parts: **Marshal**, **The Break, and Landing.** The landing is broken into subsequent parts as well but that will be discussed later.

To begin the recovery process, contact Mother on approach frequency with the *Inbound "Mother"* command on the Carrier & LSO Menu.

PARTS OF THE CASE I RECOVERY

Refer to the figures on the right through the instructions.

Marshal:

Again, Marshal is the airspace above the carrier where aircraft initially enter the pattern. In real life this is a highly structured airspace with pilot's holding an assigned altitude as they wait their turn, and even give approximate times they are expected to be allowed to proceed from one part to another. This all culminates in an actual time when the pilot is expected to be back on the deck. BMS does not go this in-depth but does set up the parts with decent realism.

Some general information:

- Holding is a left-hand pattern, with Point 1 located at the carrier's 3 O'clock position. Points 2, 3 and 4 sequentially follow in 90-degree increments, counter-clockwise around the carrier.
- Each flight has an assigned holding altitude at Marshal, based on their que, beginning at 2000 feet MSL. These assigned altitudes are separated vertically by a minimum of 1,000 feet and are assigned by order of sequence in the ATC que. As flights recover back on the carrier, successive flights at Marshal may descend to the next lower 1000 feet block down to 2000 feet. 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.
- While at Marshal all aircraft must remain within *5 NM DME* from the ship, no lower than *2000 feet MSL*, and maintain about *300 KCAS*.

NOTE: Aircraft returning for Case I recoveries must be established at their respective altitudes before entering Marshal.

NOTE: As altitudes are vacated, aircraft at the next highest altitude will descend to the next lower altitude without any instructions. When at the lowest in the stack (2000 feet), Mother will give a *Charlie* call indicating the flight at 2000 feet is cleared to begin the recovery procedure.

To this point, entering Marshal is as follows, after initial contact with *Mother*…

- Proceed directly to *Mother* on the altitude block assigned.
- When in visual contact with the carrier notify *Mother* with the "*Report See You*" call.
- Mother will respond with "Switch to Tower". Remain on PriFly, UHF #3, for the remainder of the procedure.
- Approach the carrier at the instructed altitude and enter *Marshal* from overhead the carrier into a left-hand holding pattern at a range of about 3-5 NM DME. Depending on the position in the que will determine the assigned altitude, beginning with 2000 ft. MSL. (Refer the figure on next page). Example: If No. 3 in que, assigned altitude will be 4000 feet MSL.

- Once at 2000 feet MSL and no other aircraft are in the patter, *Mother* will announce "Charlie" and give an updated BRC. Remember *Charlie* is brevity for "cleared to enter the landing pattern".

The Break:

The Break is the transition from Marshal to the landing pattern. It is set up to precisely enter the landing pattern by means of an overhead break. (Remember: *safe, efficient and deconflicted*!) The *Charlie* call is key.

The standard for departing Marshal and entering the pattern is to descend out of 2000 feet to 800 feet towards point 3 and fly to the initial point at 3 NM astern of the carrier.

When given a "Charlie" call:

- Fly to a point a head of the carrier's bow. (Overhead works just as well).
- Depart the holding pattern on a heading of approximately 180° relative to the BRC+ 30° and descend to 800 feet MSL.

The standard pattern to fly is wide tear-drop arc to a point aft of the carrier. (Refer to the figure below-right). The heading required is simply a little public math based on the BRC as a reference. Example: If BRC is 335°, set a heading of 185° (335 – 180 = 155 + 30 = **185°**). *(Clear as mud? I hope.)*

- Fly to a position about 3 NM DME behind the carrier

This large left turn back towards the carrier should set up a course parallel to this carrier's course.

- Turn inbound towards the carrier for the Overhead Approach.
- Offset close aboard to the starboard side of the carrier.

The large front panel of the Hornet makes it quite difficult to see the carrier once it dips below the nose. Either make the approach further outboard or use the steerpoint mark in the HMCS to follow the carrier.

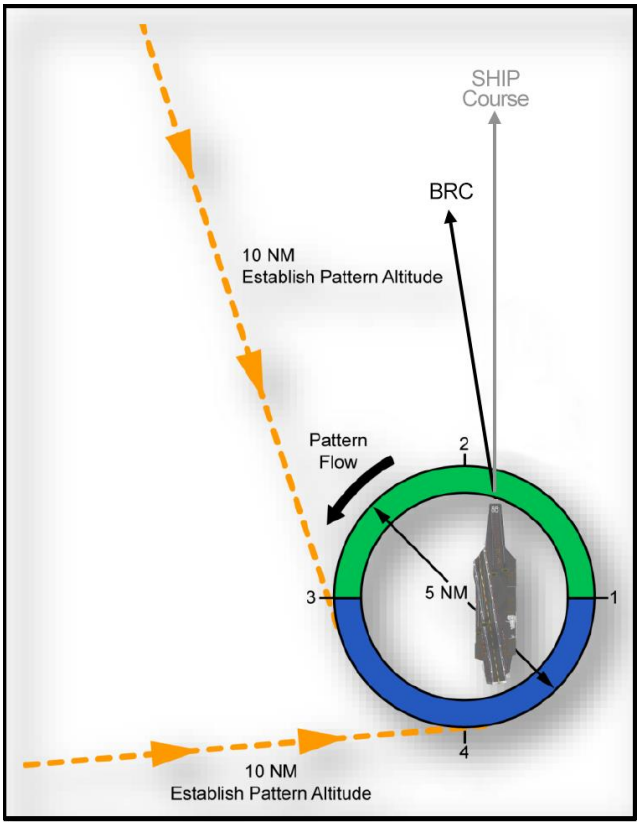
- Once abeam of the island, select "Report Overhead Break" on the ATC page and start a left 30°-45° bank turn.

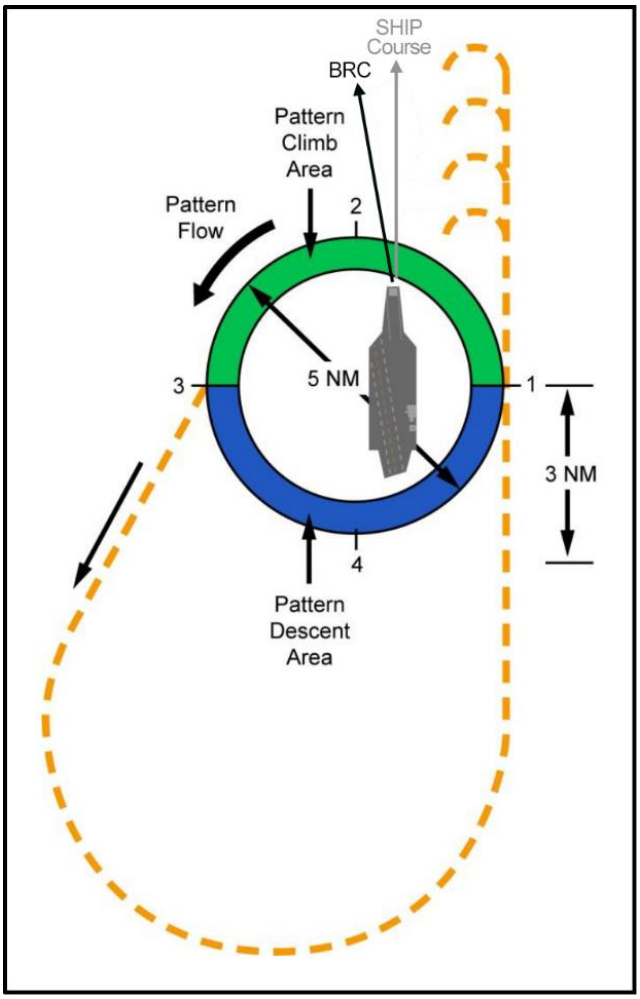
All breaks will be to the left. The break interval is determined by the last aircraft in the landing pattern. A 15-20 second break interval should correspond to a 40- 60 second landing interval.

- At the break descend out of 800 feet to 600 feet and begin to set up for the approach.

NOTE: Breaks will not be performed more than 4 NM ahead of the ship (deconfliction with possible launching aircraft). If unable to break before 4 NM, depart the pattern at 800 feet until 5 NM DME, then climb to 1200 feet and execute a left-hand arc back to the initial and contact Mother again.

NOTE: Unlike an Overhead landing procedure at an airbase, the "Break call" is mandatory for all human pilots in the flight. This is a code trigger for the LSO to give its commands on final.





Landing Pattern Entry:

The landing approach begins with the overhead break. It is broken up into 4 sub-parts, for ease of understanding. They are downwind, approach turn, the "Groove" and touchdown. Again,

just as the landing pattern of an airbase, the biggest difference is a moving runway and some minor jargon differences: The Groove is simply final approach.

Downwind – Use this point of the recovery to "dirty" the aircraft (lower flaps & gear) in preparation for landing. The heading flown is the reciprocal of the carrier's course, *not* from the BRC! When established perform landing checks:

- ✓ Maintain 600 feet & Slow to 250 KCAS.
- ✓ Flaps – FULL
- ✓ Gear (below 300 KCAS)
- ✓ Ensure Hook is down
- ✓ Set up AoA

Approach turn – While on downwind, maintain visual distance of 1-1½ NM with the carrier while performing before landing checks. Once the stern is in view (basically look for the red lights on the fantail leading to the centerline of the deck) begin a 30° bank turn. This is known as the 180 in Navy jargon, since it is roughly a *180°* turn to final (the groove). The turn may be delayed based on how full the pattern is. Keeping good situational awareness of other aircraft in the pattern, maintain 600 feet in the turn and adjust the bank angle to line up on the BRC (approximate heading of the angled deck).

CAUTION: With flaps and gear down the Hornet does tend to pitch up in BMS. Watch for this and correct it immediately so as to not climb too high or near stall speed.

The Groove & Touchdown – Simply stated the groove is Final Approach (Touchdown should be self-explanatory). This is the last opportunity to slow the aircraft to proper angle of attack for landing and contact the LSO.

- Once, *In the Groove*, control the AoA with speed and listen for the LSO's radio calls.
- Set airspeed to match & maintain the AoA throughout the descent.

The AoA/Speed relation will be determined by the aircraft's weight. A higher weight translates to a higher airspeed, etc. In real life weight & airspeed is taken into account by the deck crew to set the tension of arresting gear (remember F=MA?) But in BMS this just translates into a variation in airspeed. Generally, being on the correct AoA is about 135-145 KCAS, depending on the aircraft's current weight. Set this airspeed with the FPM aimed at the deck and control the AoA with the throttle. From this point simply begin a crosscheck of the *meatball*, maintaining *line-up* with the deck and the *AoA*.

Once at 1½ NM the LSO will announce "Paddles Contact" …and that he will "B*ring you home*" or "*We will make it easy*". Follow his commands to touchdown while maintaining the crosscheck:

- ✓ *Meatball*
- ✓ *Line-up*
- ✓ *AoA*
- ✓ *Rinse & repeat.*

The Case I recovery procedure is illustrated on the next two pages. Check out the TE in chapter 5.

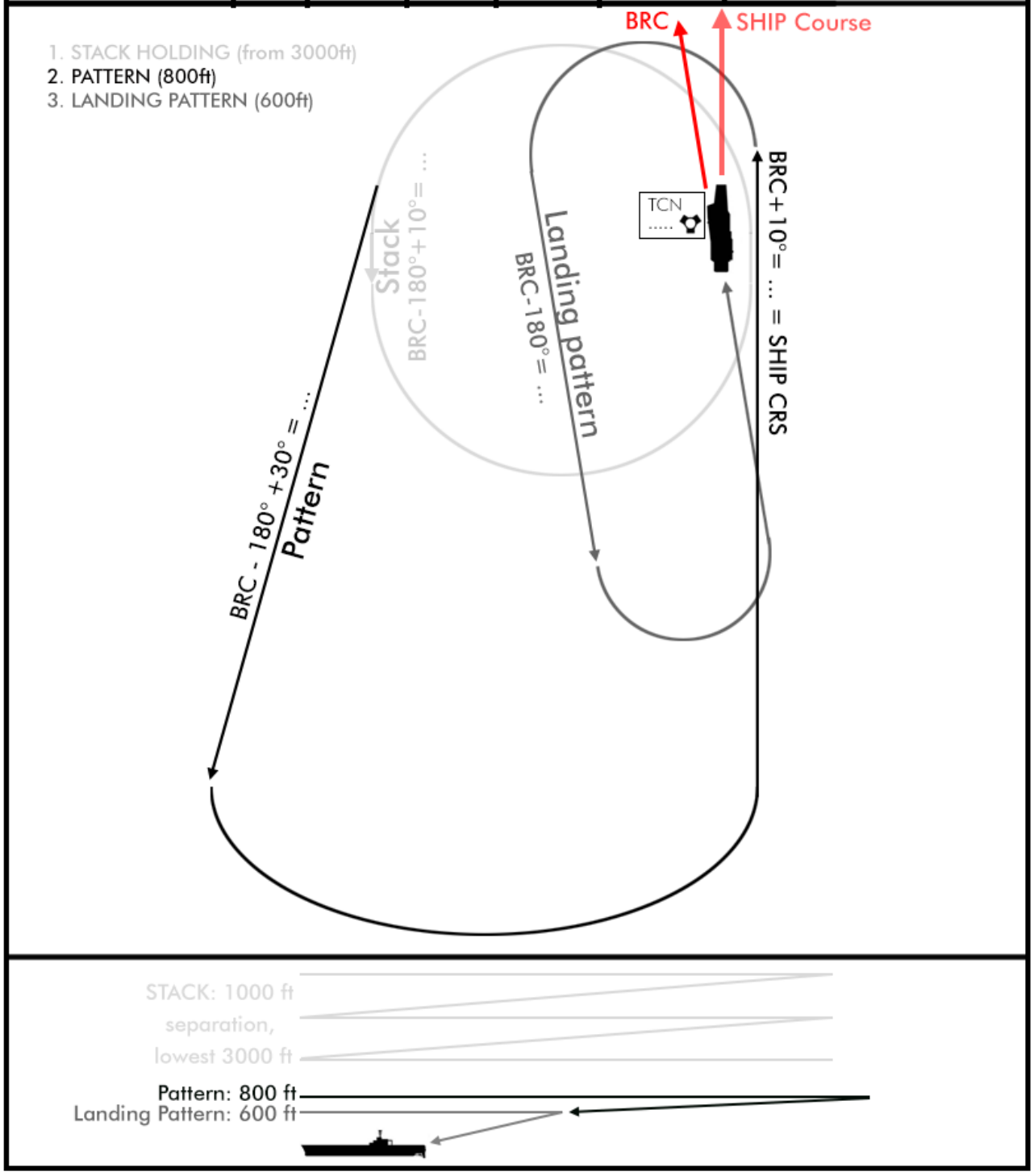
NOTE: The figure to the right simply depicts the point-of-view from the carrier and relates more to LSO duties, but it is included to give an idea and stress the importance of *Angle-of-Attack*.

KTO BMS

CARRIER CASE 1 RECOVERY

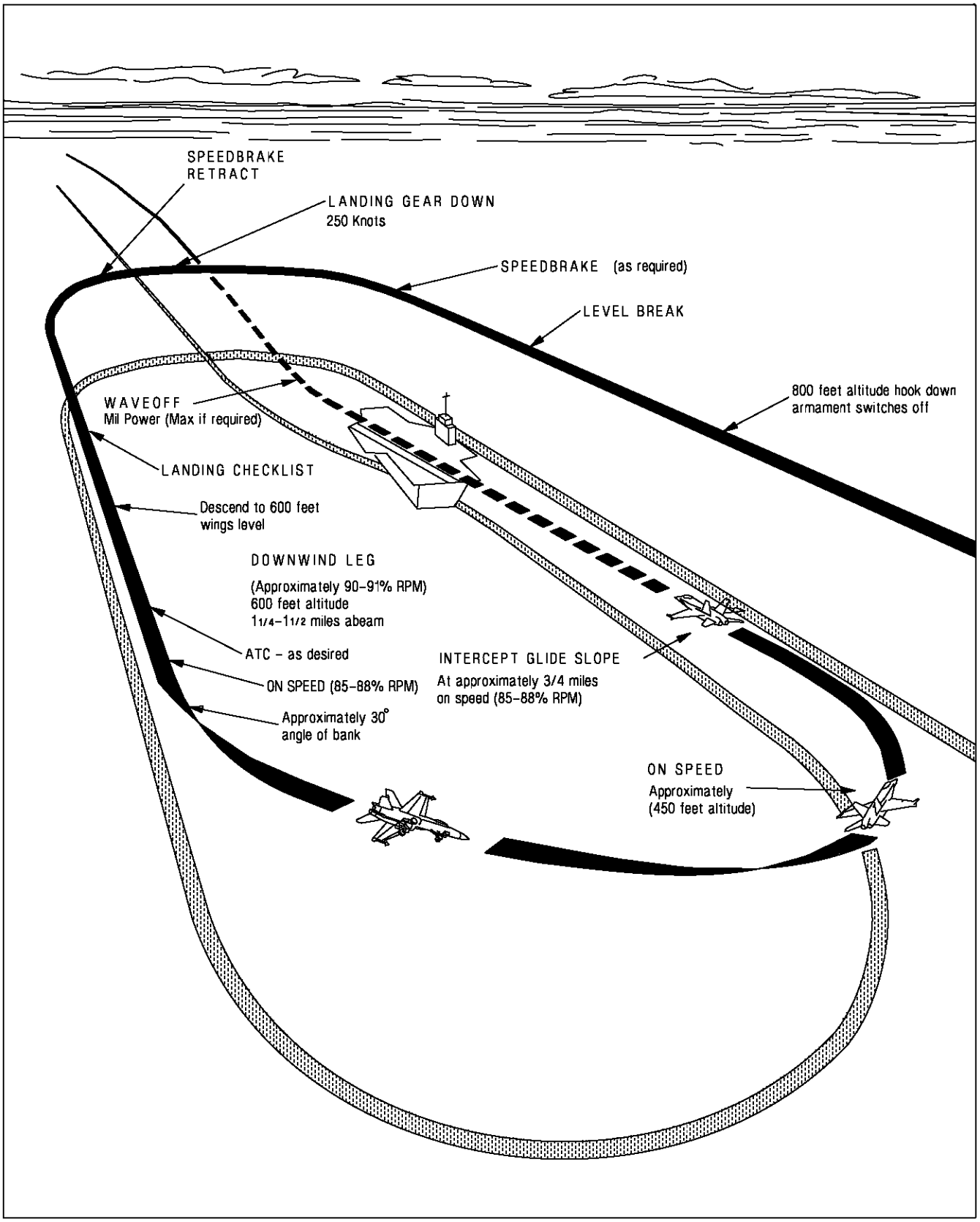
Update: 12JAN22

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



ADA520-46-1-045

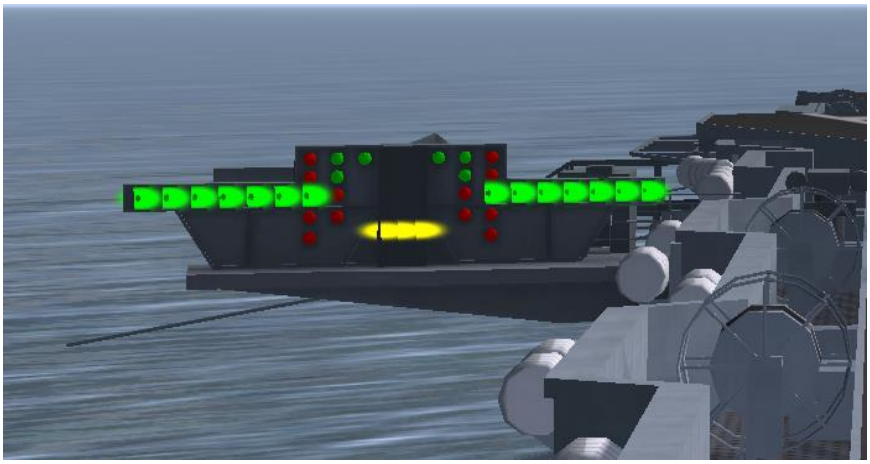
4.4.2 "Call The Ball"

Once *in the groove*, and at 1½ NM the LSO will announce "Paddles Contact" on tower frequency and request the pilot to "Call The Ball". Confirm visual contact with at least see the green lights of the optical landing system and reply to the LSO with "Call The Ball" command on the Carrier & LSO ATC page. The pilot will announce that he has the "meatball' in sight and gives aircraft callsign and fuel remaining. From this point the LSO will guide the pilot to the deck using commands.

4.4.3 Meatball Dicta for Pilots

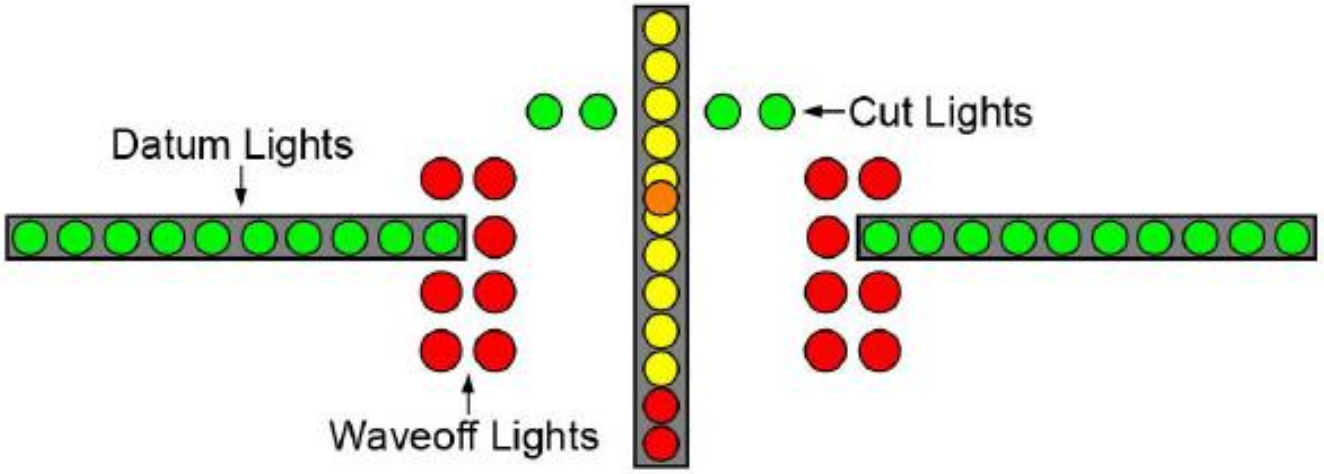
The "Meatball"

The "Meatball" is brevity for the carrier's optical landing system, or: Improved Fresnel Lens Optical Landing System (or just IFLOLS for short). This *IFLOLS*, is located on the left side of the landing deck. It provides visual cue of the optimal glideslope to the landing pilot. It also features cut lights and wave-off lights; however, *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, when below the datum lights (a low ball) indicates the aircraft is below glidepath. When the ball and the datum lights are aligned horizontally, the aircraft is on glidepath. When in the groove (final approach) concentrate on keeping the yellow ball aligned with the green datum light to stay on the ideal glidepath.



Some helpful techniques to help, “stay in the groove”.

- Fly the “cresting” ball – As with everything else in flying, being higher is better than being lower. Thus, it is not a bad thing to be slightly high.
- If low and slow, correct low then slow – Or stated another way, pitch up slightly for altitude, then apply power for a positive rate of climb
- If high and fast, correct fast then high – Conversely, if high & fast slow down first (adjust speed) then altitude. But for all intent & purpose, if too high or too fast, it is best to just use that excess energy and go around.
- If too low power up and go around. The LSO will eventually give a *Wave-off* command.
- Never re-center a high ball in close but stop a rising ball – Again, if too high, just go around!
- Fly the ball all the way to touchdown – With so much time in the Viper, it is the habit of all pilots to use the flight path marker to gauge the groove. Attempt to change this habit pattern and use the meatball instead.

The Russian & Chinese carriers also have a Fresnel lens system. While a bit different in construction (The “meatball” is replaced with red, amber & green lights) the concept is still the same. Green is “good” or *on glideslope*, Red is “bad” or *too low*! And Amber is caution.

4.4.4 Landing Signal Officer Radio Calls

The BMS LSO's job is to correct the final approach of landing aircraft. Or stated in Navy terms: *Help the pilot maintain the Groove.* Communication with the LSO is performed on the tower frequency. The first call of the LSO will be "Paddles Contact" to confirm he is visual at about 1½ NM, followed by "Call the Ball". This *Call the Ball* is the only LSO call requiring a pilot response. With the Call the Ball menu option on the ATC Carrier & LSO page, the pilot will confirm visual contact with that meatball, and announce the callsign and the fuel state. This call from the Carrier & LSO Page is mandatory for LSO's code execution. Failure to do so will prevent the LSO from providing guidance and the radio will remain silent.

To communicate with pilots the LSO uses several preformatted messages which all have a very specific meaning. None of them (except calling the ball) require acknowledgement.

Here is an explanation of the LSO vocabulary:

PADDLES CONTACT:	The LSO initiates contact with the landing aircraft.
CALL THE BALL:	Directive call to confirm visual with the meatball and state callsign and fuel state.
ROGER BALL:	LSO acknowledges the pilot ball call.
DROP YOUR HOOK:	Self-explanatory. Comply unless planning to perform touch & goes.
YOU'RE (A LITTLE) HIGH:	Aircraft is (slightly) above glide path. Adjust sink rate by reducing power to center the ball.
YOU'RE (A LITTLE) LOW:	Aircraft is (slightly) below glide path. Adjust sink rate by increasing power to center the 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 is left of the centerline. Reestablish line-up by sliding right.
YOU'RE LINED UP RIGHT:	Aircraft is right of the centerline. Reestablish line-up by sliding left.
EASY WITH YOUR WINGS:	Magnitude of line-up correction is excessive. Reduce magnitude of line-up corrections to intercept and reestablish centerline.
EASY WITH YOUR NOSE:	Magnitude of nose attitude correction is excessive. Reduce magnitude of nose attitude to intercept and reestablish optimum aircraft attitude.
EASY WITH IT:	Magnitude of power corrections is 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 (usually a go-around call will follow).
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.
WAVE-OFF:	Directive call to execute a go-around.
BOLTER:	Call to inform the pilot that the hook did not catch any wire. Throttle up and go around!

Wave-off:

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

Wave-offs are *MANDATORY* and are performed along the angled deck heading unless otherwise directed by the LSO (I.E., "wave-off starboard side"). Wave-offs may result from a fouled deck, winds out of limits, or aircraft not set up for a safe landing.

To perform a wave-off, simultaneously

- ✓ Advance throttles to military power (afterburner if necessary)
- ✓ Retract speed brakes & gear
- ✓ Maintain landing attitude (not to exceed optimum AoA)
- ✓ Level wings
- ✓ Confirm a positive rate-of-climb.

Once established in a climb and abeam the bow, make a right turn to the carrier's course (BRC + 10°). Climb to 600 feet and turn downwind with proper interval. Repeat the 180 and Abeam to the Groove and at 1½ NM from the carrier, the LSO should once again state "Paddles Contact".

Bolters:

A *Bolter* is a situation where the aircraft misses all the wires on the carrier. The LSO will call "Bolter! Bolter! Bolter!". Simply stated, if a wave-off is a *missed approach*, a Bolter is a *touch & go*.

Since all carrier landings are supposed to apply full MIL power at touchdown depending on the aircraft type (F-14D in real life do not use afterburner) a bolter situation doesn't require any specific action as the aircraft generally has enough energy at the end of the deck to become airborne. Confirm a positive rate-of-climb and apply the same wave-off procedures.

The one difference in BMS vs. Real-Life is an actual deck handler running out to the pilot's field-of-view giving a signal to *throttle back, the wire is caught*. BMS does not (currently) have deck hands, therefore keep power in until it is evident the aircraft has been trapped. Not to worry though...A trap is quite evident: The aircraft continues off the edge of the deck and the LSO's call of "Bolter! Bolter! Bolter!". If the aircraft is not trapped there is a *good second* to throttle-up and go-around!

LSO grades

LSO grades are not implemented in BMS.

4.4.5 Catching the Wire

BMS models the arresting gear quite accurately. Most importantly it stops the aircraft! Additionally, after the aircraft is stopped, the wire pulls the aircraft back a bit which frees the hook from the wire. What is not modelled, which is mostly transparent to the pilot, is a deck crew setting the arresting gear based on the aircraft's weight. The only benefit of this would be adding to the pilot's workload while on downwind.

Quickly perform an after-landing checklist:

✓ HOOK – Retract.
✓ WINGS – Fold.
✓ NWS – On.

Throttle up and taxi off the angled deck where tower will instruct a switch to ground, just as on land. Do not delay leaving the angled deck area as other aircraft might be in the groove right behind you!

Welcome back!

4.4.6 Case III Recovery

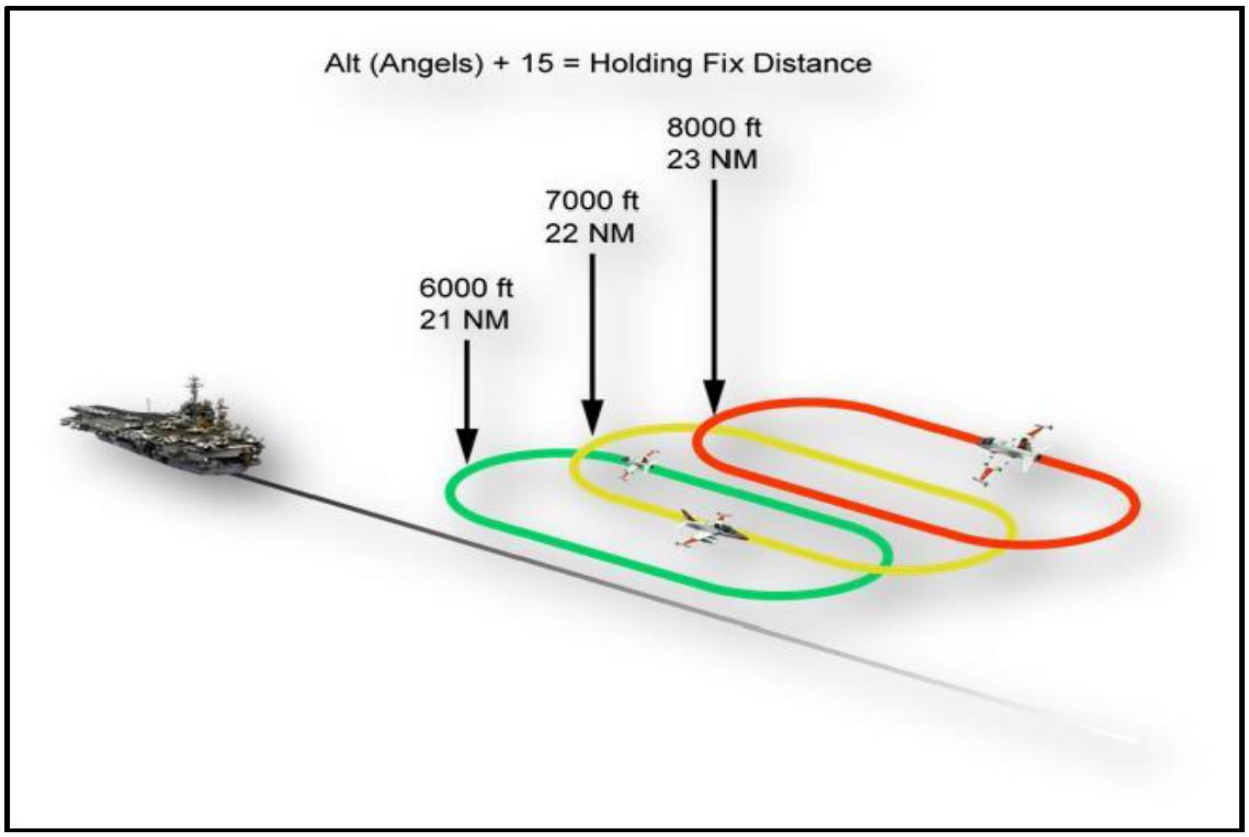
And now for something completely different! As mentioned earlier the Case III recovery is used for all night operations, as well as during the day when the weather is below Case I minimums. The parts are a bit simpler than a Case I: no overhead break required, but precision flying is still the norm. *Remember, listen carefully to ATC's instructions and be precise with altitude and DME to trigger the appropriate ATC calls.*

NOTE: Case III is an instrument approach. So before commencing the approach, be sure to have the carrier's TACAN & ILS frequency at the ready. This should be done prior to contacting Mother.

Marshal:

Marshal, again, is where all aircraft congregate in que, awaiting their turn for a *Charlie* call and make an approach. After initial contact with Mother on the approach channel, Mother will vector each aircraft to the *Initial Approach Fix* (IAF). Ideally, the holding fix will be on the reciprocal radial (180° in the opposite direction) relative to the carrier's BRC. Aircraft will hold on this assigned radial beginning at a distance of 21 NM and 6,000 feet for the first aircraft (or the next aircraft in the que for landing). Subsequent aircraft will hold at an interval of +1 NM & +1,000 feet. The US Navy has created a handy formula just for Case III Marshalling: $(\frac{Altitude\ in\ feet}{1000} + 15\ NM)$. Or stated simply: *6000/1000 = 6 + 15 =* ***21 NM***!

In the example below, the first holding point is 21 NM DME at 6000 ft, the second at 22 NM DME at 7000 ft (7000 – 1000 = 7 + 15 = 22 NM), the third at 23 NM DME and 8000 ft and so on. The holding pattern is a six-minute left-hand racetrack. Unless otherwise briefed, the pattern will be flown at max conserve fuel flow or standard holding airspeed of about 300 KCAS. 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.



Case III Marshal pattern.

NOTE: AI is not coded to fly racetracks, rather constant circles.

Approach:

Upon the *Charlie* call, reference the bearing to the carrier and commence the approach:

- Establish a 4,000 foot per minute rate of descent at 250 KCAS on bearing to the carrier.
- At 5,000 feet MSL make a "Report Platform" call to Mother (on approach frequency) and reduce the rate of descent to 2,000 feet per minute.

At some point during the approach, Mother will call "Switch to Tower".

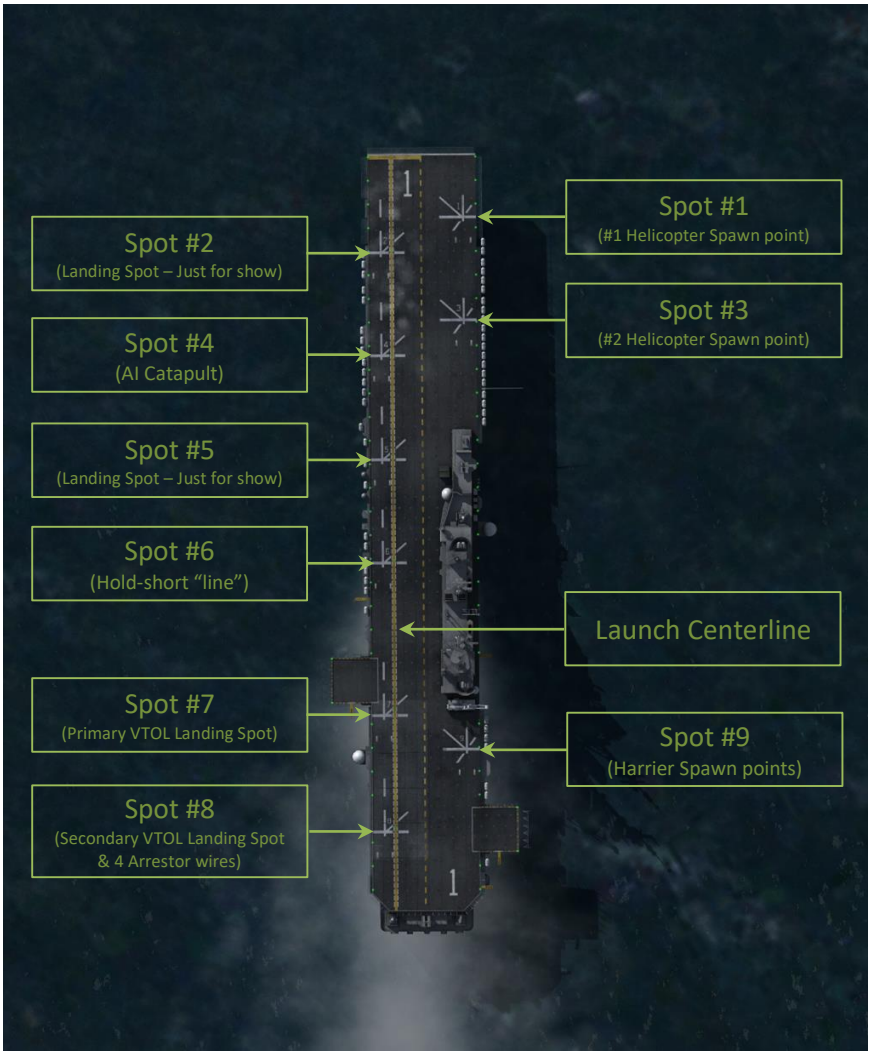
- Maintain the decent until reaching 1,200 feet.
- Level-off and prepare for landing.
- Initiate landing checks by 10 NM DME.
  - ✓ Hook – Down
  - ✓ Flaps – FULL
  - ✓ Gear – DOWN (Below 300 KCAS and by 6 NM DME).
- At 6 NM, slow to final approach speed of ~150 KCAS.
- ILS lock should be established at around 3 NM.

If this is all done correctly, the readout on the approach radar confirms ILS correct position (basically the code is tripped), the LSO will direct, "Fly the Needles" and from this point, make a standard IFR approach. Pretty simple, right?

4.5 LHD Operations

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

In BMS only the USS Wasp Class LHD is implemented. The Wasp is primarily meant to be used with the Harrier and helicopters. The AV-8B and AV-8B+ are fully operational from the USS Wasp for both AI and human pilots. Since AI is unable to operate in the V/STOL mode compromises are made for AI to be able to use the ship. Therefore, the Wasp has been equipped with *AI launch catapults and 4 arrestor wires*. Only AI aircraft may use catapults and the arrestor gear. For human pilots flying the Harrier these can be ignored and 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 landing positions. Only two of them (spots #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. Up to six Harriers may spawn in line behind the ship's island from spot #9 to the fantail. Spot #8 is where the AI arrestor wires are placed allowing the AI Harriers to land on the WASP with their "imaginary" tailhooks.

The AI catapults are positioned close to spot #4. AI controlled Harriers will taxi to this spot for launch. We humas must perform a short take off procedure for launch. The consequence is that the coded "line" where ground commands the switch to tower frequency is not triggered until spot #6. This is the ATC hold-short line. Launching from spot #6 is the most concerning issue on the Wasp for human operation as the aircraft weight is much more a factor for Harriers. The AV-8 may only takeoff from spot #6 at around 23,000 Lbs or less. Any greater takeoff weight, a short take off procedure should require starting as far aft as possible (generally from spot #7 or further). With this in mind, feel free to ignore the ATC procedure and take-off in as safe as manner as possible.

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 be readied for a short take-off.

Generally, a real Harrier does not take-off vertically from the LHD. A rolling take-off is the preferred form of launch. Starting from the stern (aka fantail or aft end) of the ship with nozzles set to zero degrees. At a certain position during the take-off roll the nozzles are rotated to a predetermined "STO" nozzle angle position which is depending on gross weight and atmospheric conditions.

In BMS the "STO nozzle angle" is not coded in, preventing such procedures to be executed accurately. Therefore, it is dependent on the pilot's skill to rotate the nozzles to a specific nozzle position. Depending on gross weight, the BMS Harrier is able to perform a rolling take off with nozzle set at 50° to 60° right from the beginning of the take-off roll.

The Harrier's empty weight is 14000Lbs and internal fuel is 7800 Lbs. Without any-armament the Harrier's ramp weight is 21800 Lbs. This allows for 1200-4200 Lbs. (23000 – 26000 Lb take-off weight) of weapons. Any amount of armament above this, consider sacrificing fuel and plan for aerial refuelling enroute, just to stay below the 26000 Lbs limit. The results of testing (with many crashes into the sea) identified the maximum gross weight for LHD short take-off is 26000 Lbs, starting from the stern with nozzles at 50°. Anything above that (max Gross weight of the AV-8B is 31000 Lbs) the probability of ending up with *Dave Jones* in the briny deep is high!

Between 23000 & 26000 Lbs, start as far back on the stern as possible. This should ensure enough speed by the end of the deck. (Below 23000 Lbs, start from position #6 and enjoy the proper ATC procedures). The take-off is performed normally with a 50° - 60° nozzle angle throughout the procedure. Once safely airborne with gear up and the jet accelerating, rotate the nozzles back to 0° and enjoy flying light a plane once again.

Obviously starting the take-off roll with nozzle set at 0° will provide more speed but it will not generate enough lift at the end of the deck to maintain level flight, much less a climb. Thus, it is incumbent for the pilot to be able to quickly rotate

the nozzles to 50° – 60° immediately, once clear of the deck. A general technique is to practice this sort of launch on land first, with HOTAS programmed for quick reaction. Once proficient with this style of launch a heavier take-off weight than 26000 Lbs may be an option.

NOTE: Performing this launching procedure the *fowls the deck*, the same as if holding at the beginning of a runway. This will block any AI aircraft attempting to land.

Vertical recovery on the WASP

AI piloted Harrier will trap on the Wasp just like Hornets 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 a human-piloted Harrier can perform the same procedure it is not necessarily the desired method when flying the Harrier. The desire is to try something new and discover what it takes to be a real Marine Corps pilot and land vertically. *(Semper Vertical!)* That means transitioning from horizontal flight to a hover just abeam the designated landing spot and then gently translate over the landing spot and land.

Transitioning from horizontal flight to hover: After the break turn over the ship, start slowing down on downwind and dirty the aircraft:

✓ Gear down,
✓ Flaps – Confirm down
✓ Maintain 600 feet
✓ Fly 210-220 KCAS.

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). At approximately 5 NM from the ship begin to transition to hover. Set the nozzle to 60° and monitor the deceleration while maintaining an altitude above 500 feet.

At 2 NM, set nozzle to 80°. Again, BMS does not have a *hover-stop position* coded for the nozzles, which is determined by gross weight and atmospheric conditions. Setting the nozzles to 80° will provide a nice transition to hovering abeam the landing spot. The aircraft should loose forward momentum. Keep in mind that the approach procedure is more about *closure rate* thank just airspeed. If the closure rate appears too fast, gently pitch up a bit and/or rotate the nozzle further forward to 90° or even 100°. Rotate back to 80° when satisfied with your closure rate.

NOTE: From this moment control of altitude is performed with the throttle, pitch & roll is still performed with stick movement and speed change (closure rate) is performed with a combination of pitch and nozzle rotation angle.

Once airspeed decreases below 60 KCAS the HUD airspeed scale will go to zero. (Just as it does when taxiing in the F-16). At this moment a good technique is to select the INS page (LIST + 6) to display the groundspeed reading and match it with the speed of the ship. During flight operations the ship is sailing at 18-20 Knots into the wind so a 15-20 Knot groundspeed should suffice for closure. It may seem a bit awkward, being so slow, but the object is to simply “fly-formation” with the ship.

The primary landing spot is spot #7 and secondary landing spot is spot #8. Try to avoid the landing positions near the bow and always shoot for the landing spots near the stern.

The deck of the Wasp is 60 feet high so begin the hover around 150-200 feet MSL. Normally the final hover approach is made at about 100 feet (+/- 10 feet, or 50 feet above the deck).

To reiterate, *hovering is very challenging*! It is very easy to get out of position and lose visual reference with the ship. But no more challenging than flying close formation or aerial refueling. The difference here is being extremely slow, right on the edge of falling out of the sky, keeping formation with a 40,000-ton ship. Simply remember *small control inputs, keep the power in (this is the only thing keeping you from swimming) and maintain a reference point* on the LHD, just as flying formation with any other jet.

The primary reference point is the landing spot markings, but they will eventually slide under the aircraft, away from line-of-site. Another option is to use the LHD's island as a reference point. Simply place landing spot in-line with the aircraft and the island. It is quite challenging in real life as well, but with everything in life, *Practice Makes Perfect*.

Once over the deck, maintain visual cues (or maintain the position over the spot) and gently reduce the throttle.

Once the main wheels touch the deck, the Harrier may experience a weird forward roll for no apparent reason. So apply breaks upon touchdown. This is why using the forward landing spot on the Wasp is not recommend.

Unfortunately, the vertical landing procedure on the WASP does not quite suit the ATC approach procedure which are based on the conventional arrester landing. Note that the code may initiate LSO calls. Simply ignore any commands in order to land the Harrier safely on the ship.

5. CARRIER OPS TRAINING MISSIONS

Naval training missions are performed with the F/A-18 & AV-8B aircraft since they feature full 3D cockpits and an AFM. This chapter correspond to the BMS carrier operations training missions. The principles are the same as the other missions in the training document but have been moved here due to their relevance with this manual. Refer to the instructions and techniques periodically in Chapter 4.

The training missions are started from the Tactical Engagement tab of the UI. They are numbered as follows:

- TE Mission 23 is a carrier launch.
- TE Mission 24 is a Case I recovery.
- TE Mission 25 is a Case III recovery.
- TE Mission 26 is a training mission for V/STOL operations.

5.1 Mission 23: F/A-18 Hornet – Carrier Launch

PREAMBLE: This training mission assumes basic familiarity with the operations of the aircraft and its communications systems. While there are similarities with the Viper's avionics, switches and buttons have their own place in the Hornet. It is recommended to create an F-18 TE from an airbase to become familiar with its flight model and avionics.
LOCATION: On the deck of the USS Enterprise (CVN-65) – 35 NM West of Gunsan Airbase, South Korea
CONDITIONS: F/A-18D – Single ship – Callsign Spade 1-1 (Package 4965). Once in the cockpit the training scripts will freeze BMS and setup the systems accordingly.
GW: 42365Lbs – 3 AIM-120C – 2 AIM-9X – 1 ATFLIR – 1 centerline Fuel tank
Max G: +7/-2; Max airspeed: 600 KIAS (Mach 1.6)
WEATHER: 2300 Zulu, TRL140 360/15Kt 9999 FEW 050 28/18 Q1013 NOSIG
GOAL: Successfully taxi to the catapult and launch the aircraft.

5.1.1 Taxi

Select the single ship F/A-18D Hornet in Package 4965. Check the mission briefing for weather and other NOTAMS. Also ensure the communication frequencies for the Carrier ATC have been saved to the DTC. Just as on land, the radio code will assign UHF Pre-sets #2, #3 & #4 as ground, tower, and departure respectively.

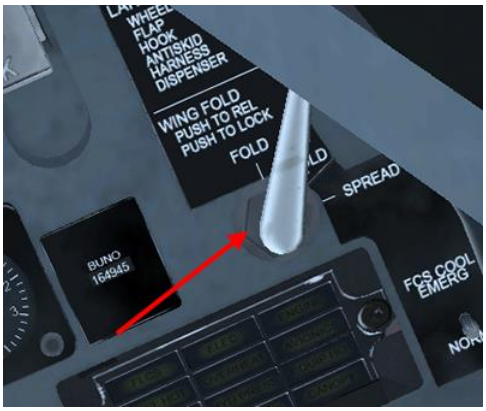
For this training mission commit to TAXI. Committing to RAMP is an option, but performing a ramp start of the F/A-18 is outside the scope of this training mission.

Upon entering the cockpit, the aircraft will be hot and chained to the decks (chocked) with the wings folded. The AI jets taxi on the carrier by means of taxi points just as on land. Due to the confined space and with aircraft taxiing very close,

it is preferable to leave the wings in the folded position until just prior to hooking up to the catapult. A standard technique is to unfold the wings once given clearance to hook-up to the catapult.

Set the UHF radio to Ground (USS Enterprise's ground frequency is 265.300) UHF Pre-set #2, and request "Ready to Taxi" with the Ground Page in the ATC menu. Expect to be queued as number 2 after the E-2 Hawkeye and given an approximate taxi time.

NOTE: Remember, the carrier needs to steam into the wind to launch and recover aircraft. A good technique is to contact ATC early for taxi clearance to allow the ship enough time to turn into the wind while completing before take-off checks.



When ATC calls back with clearance to taxi, un-chock/chain the aircraft, activate NWS and hold the breaks. Ensure the deck is clear (i.e., no taxiing or landing aircraft) taxi towards the #2 (port-side bow) catapult, behind the Hawkeye. The jet blast deflectors will be raised in preparation for the Hawkeye's launch.

NOTE: Flight and element leads will always hook-up on the port catapult, the wingmen will always take the starboard catapult.

CAUTION: The rate of turn of the Hornet NWS is much more significant than the F-16, allowing much tighter turns on the deck of the carrier. Another reason why it is a good idea to "learn the aircraft" on land first.

Ground will advise to contact PriFly (tower frequency). Switch to UHF Pre-set #3 (265.200) and contact PriFly with "Ready for Departure". After the Hawkeye launches the blast doors will lower and PriFly will state either "*Position and Hold*" or give clearance for launch depending on the game time.

Before hooking up to the catapult, ensure the aircraft is ready for flight! Unfortunately, there is currently no checklist for the F-18 or carrier ops. Feel free to create one, but remember the following pre-launch steps:

✓ Wings – Unfold (Visually check they are locked in place).
✓ Launch Bar – Extend (the aircraft will not connect without)
✓ FLAPS – Set (Set to either HALF or FULL depending on weight).
✓ T/O Trim – Set to take off trim (Hold the keystroke for a couple seconds).

Once the jet is configured and given clearance, carefully taxi onto the catapult.

NOTE: Do not delay as calling ready assigns you a position on the CAT.

5.1.2 Hooking Up to the "Cat"

Move forward at low speed maintaining a line up with the catapult rail. Continue at slow speed until the aircraft connects with the shuttle. It is noticeable when the aircraft's launch bar connects. The nose of the aircraft dips slightly and the aircraft stops. Remember the graphical depiction of references to use in Section 4.2.

Now that the launch bar is attached to the catapult shuttle, ***ensure*** the launch-bar switch is placed in the retract position. Once the aircraft comes off the deck it will automatically return to the **up**, or retracted, position. Remembering to switch it in the retract position after launch and before retracting the gear is highly unlikely!

<u>WARNING</u>: After hooking up to the catapult shuttle and prior to launch, the Launch Bar *<u>must</u>* be retracted to allow proper retraction of the landing gear. Not doing so will not allow nose gear retraction and possibly damage to the landing gear.

If this does occur (*And it will!*)

✓ Maintain 250 KCAS
✓ Lower the landing gear again
✓ Retract the launch bar
✓ Attempt to retract the landing gear.

That should do it. Careful pilots would abort the mission but in fairness, you fixed the issue and did not break the jet.

At the assigned takeoff time the tower will give the standard clearance call with winds just as on land. Check the flight controls are free and correct and that the Jet Blast Deflectors have raised. The aircraft is now ready for launch. Throttle-up to full afterburner. The catapult steam will build (note more steam coming from the catapult). Once the pressure is sufficient for the aircraft's weight, the catapult will automatically fire, and the aircraft will be launched from the carrier deck.

<u>NOTE</u>: If the Take-off trim is set, the aircraft will fly out on its own, pitching up after launch. Feel free to attempt a hands-off launch just to test out the take-off trim settings. The only occasion the pilots need to apply back pressure on the stick for take-off is when take-off trim was not 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?*) Climb straight ahead and avoid turning left (into the waist catapult path).

PriFly will instruct to switch to departure. Switch to UHF #4 and report airborne. Proceed as per standard navigation procedures. *Well done* you successfully launched from the carrier deck!

There's no real difficulty in launching, except maybe *forgetting to retract* the launch bar once in the shuttle. The hardest is yet to come: a carrier recovery!

5.2 Mission 24: F/A-18 Hornet – CASE I Recovery

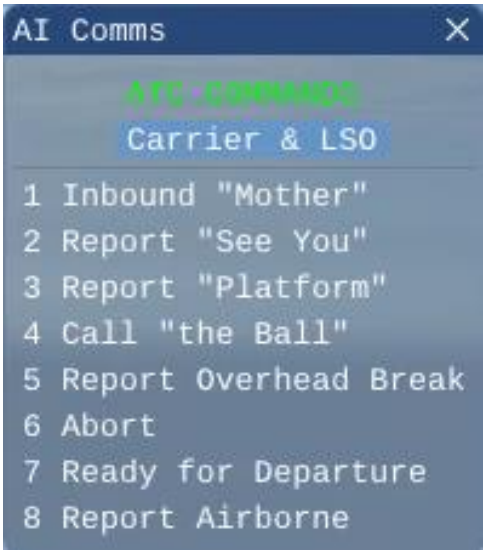
PREAMBLE: This training mission assumes basic familiarity with the operations of the aircraft and its communications systems. While there are similarities with the Viper's avionics, switches and buttons have their own place in the Hornet. It is recommended to create an F-18 TE from an airbase to become familiar with its flight model and avionics.

LOCATION: In flight, 14 NM west of the USS Enterprise (CVN-65).

CONDITION: F/A-18D – Single ship – Callsign is Spade 1-1. Once in the cockpit the training scripts will briefly freeze BMS and setup the systems accordingly.
GW: 42365Lbs – 3 AIM-120C – 2 AIM-9X – 1 ATFLIR – 1 centerline Fuel tank
Max G: +7/-2; Max airspeed: 600 KCAS (Mach 1.6)

WEATHER: 2301 Zulu TRL140 113/15Kt 9999 FEW 050 28/18 Q1013 NOSIG

Select the single ship F/A-18D Hornet in Package 4965. As always check the mission briefing for weather and other NOTAMS and DTC is saved to ensure the communication frequencies for the Carrier ATC are uploaded. Upon entering the cockpit, the aircraft will be just over steerpoint #9, at approximately 3000 feet, 350 knots, heading 090.



Select steerpoint #10, contact *Mother* on the approach frequency UHF Pre-set #4 (265.100) and select *Inbound "Mother"* on the Carrier & LSO page.

NOTE: Carrier operations has its own ATC Command menu. Besides requesting QNH or winds, all landing operations are conducted using this page.

Mother will reply with Case I and the *Base Recovery Course* (BRC). Remember that BRC is essentially the heading of the angled landing deck. Use it just as using the landing runway. (Example: "Spade 1-1, Mother is Case I, BRC is 113")

Remember that Case I recoveries are separated into *three* stages:

- Marshal: The holding pattern above the carrier in 1000-foot intervals.
- The Break: The transition from Marshal to landing.
- Landing Approach: Which consists of the downwind, abeam, *The Groove* & Touchdown.

NOTE: This training scenario is single ship but in the case of a 2 or 4 ship flight, all wingmen automatically slide into a tight right echelon formation in preparation for entry into Marshal. They should stay in this right-close wingtip formation until the break to the landing pattern. *Right echelon formation* is standard since all turns from Marshal to landing are to the *left*.

Fly directly to the carrier (the steerpoint marker should remain on the carrier) and select *Report "See You"* option on the ATC Commands Carrier & LSO page when visual. Mother will acknowledge and give a Marshal altitude. In this case expect 3000 feet. Mother will then instruct "Switch to Tower".

Switch to UHF #3 and set up to enter the Marshal stack at 3000 feet MSL. There is no requirement to contact Mother (ATC) from this point. The flight of four Hornets will be stacked 1000 feet below about to depart Marshal for the approach. Listen and Mother may be heard giving them a *Charlie* call with an updated BRC.

Reduce speed to best fuel-conservation (around 300-350 KCAS) and fly direct to the ship. Technique only, but this is a good time to lower the hook: One less thing to remember during the recovery.

Once over the carrier, begin a level left turn. Maintain 3000 feet and continue the turn until about 3 NM DME. Place the carrier at the 9 O'clock position and leave it there during the turn.

Relax for now and listen in on the landing flight's calls with the LSO. Listen closely to which aircraft is landing. The importance of this will become apparent in a bit.

NOTE: In the real world this procedure, from initial contact to landing, is very choreographed. Naval aviators (remember, they're "better than Air Force pilots", so sure!) perform this procedure with little to no communications. The same is true in BMS' Case I recoveries. There is little requirement to keep in contact with Mother. *With this in mind*, ATC will not advise or clear a descent out of the initial Marshal Altitude. It is incumbent on the pilot to listen to the comms and have good *Situational Awareness (SA)* on how many flights are below them. When a flight lands on the carrier, that is implied clearance to descend to the next lower 1000-foot block until at 2000 feet. If at the 2000-foot block, clearance is implied to descend and set up for the overhead break.

At the point of the previous flight's break-call, is a good point at which to begin a descent to 2000 feet MSL. Again, *do not expect* Mother to give a clearance to descend! (Remember, you're a *Naval Aviator*)! After the 4-ship flight's break call they will enter the landing pattern at 800 feet. From that moment there is a lot of comms from these guys as each will be sequenced under the LSO guidance on the tower frequency.

Expect a *Charlie* call once all aircraft of the previous flight has trapped on the carrier. Mother may update the BRC at this time. A good technique, besides writing it down, is to input the BRC in the CRS setting of the ILS DED page, or on the HSI. If in a different scenario with multiple flights at Marshal, the next flight in que will descend 1000 feet as well, so do not delay the descent.

Once Mother states: "Charlie Now", continue the left-hand turn, to a position over the carrier. From this overhead point, set a heading that is the reciprocal of the BRC, +30°. (Example: If BRC is 113°, fly a heading of 323°. 113+180+30=**323°**. Or 210° from the BRC). Continue the turn to 323° and descend to 800 feet out to about 3-5 NM DME. Turn back towards the carrier. Perform these steps in whatever order works, there is no requirement of a sequence. Just ensure not to extend past 5 NM.

Line up on the carrier's course (*not the BRC*) at 800 feet MSL and approximately 300-350 KCAS.

Once abeam the carrier's island announce an overhead break with the *Report Overhead Break* option in the ATC menu's Carrier & LSO page, then begin a left-hand break. Maintain 800 feet, but let the airspeed begin to fall.
NOTE: Make it a habit to always make a Break Call for Naval Ops. *The LSO AI needs to know*.

Enter the downwind, and once established below 300 KCAS begin to configure for landing:

✓ Gear down
✓ Flaps Full
✓ Check Hook down

And descend to pattern altitude of 600 feet.

Continue to slow to the airspeed for proper AoA. Once established engage the auto-throttle. *Remember* there is no cockpit switch for the auto-throttle so it must be managed through a key-binding or HOTAS programming. The auto-throttle will maintain AoA when the flaps are set to Half or Full.

When configured for landing, gauge the lateral separation from the carrier, keeping a lateral distance of about a mile to a mile and a half. Look for the abeam reference of the carrier's stern. A good abeam reference is seeing the red lights on the fantail leading

to the deck. Begin a gradual 30° bank turn. Maintain 600 feet around to the *Groove* (aka final) and until the LSO calls contact.

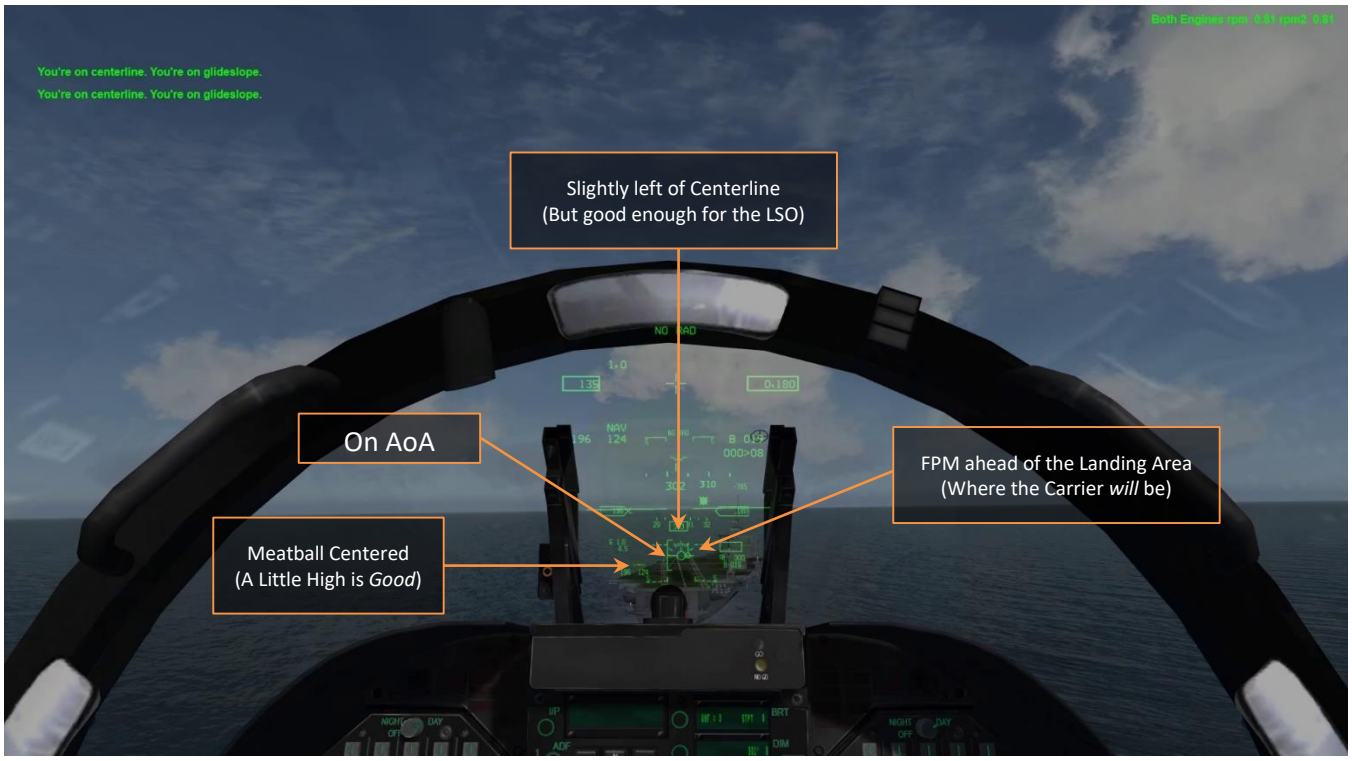
At 1½ NM the LSO will announce, "Paddles Contact, Call the Ball". Gauge the line-up with the Meatball and the deck's centerline and reply with option 4 "Call the Ball" on the Carrier& LSO page.

NOTE: It is recommended to *not use* the keyboard. There is very little time for this. Try either a voice activated command software or a HOTAS function for this. Another option is a Helios touchscreen profile.

From here on the LSO will guide the approach by giving directions on lateral and vertical position, and airspeed. Follow his directions and place the Flight Path Marker just above the wires. Or essentially where the carrier "will be" at touchdown, and *not* where it is *now*!

NOTE: The auto-throttle is a real game changer and reduces workload tremendously.
Align the FPM slightly right of the landing deck centerline (to compensate for the carrier's forward movement) and ahead of the wires. Auto-throttle should maintain the AoA down to that point! Without auto-throttle, manage the AoA *using* the FPM with throttling.

If all goes according to plan, the jet will "crash land" on the deck and the hook will trap a wire.



If the LSO issues a wave off, he considers the approach unsafe. Stay in the landing pattern and maintain 600 feet. Continue pass the carrier's bow and turn downwind for another try.

If the LSO issues a bolter call, that means the hook did not trap any wires. Throttle up and go-around. Some may suggest throttling up to afterburner in anticipation of a possible bolter, but at landing speed, with full military power, the aircraft should have enough energy to become airborne once off the deck. Stay in the landing pattern for another try.

If the aircraft traps, the deceleration is quite noticeable. Throttle back to idle, the aircraft will roll back a bit.

Perform an after landing check:

- ✓ Hook – Raise
- ✓ Wings – Fold
- ✓ Nose Wheel Steering – Engage

Throttle up and taxi clear of the landing deck. Tower will instruct to switch to ground frequency (Pre-set 2) and taxi back to the parking position.

Do not forget to chock (chain) the aircraft so it does not roll off the deck!

Welcome back. Get a shower & relax a bit for now. You will need it for your next lesson: *Case III Recovery!*

5.3 Mission 25: F/A-18 Hornet – CASE III 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 NM South-West of CVN-65 USS Enterprise level at 20000 feet MSL on top of the weather. Please note, any position in the flight is available. The most interesting position is the #2 or #4 aircraft. The #2 because there will be aircraft below and above you in the holding. The #4 aircraft because you will hear the landing procedures and will have plenty of time to set up for the approach. This chapter will instruct from the perspective of the #4 position. But this instruction will apply to any position within the flight.

CONDITION: F/A-18C – Four ship – Callsign Spade 1-4

GW: 39300 Lbs – 3 AIM-120C – 2 AIM-9X – 1 ATFLIR – 3 fuel tanks

Max G: +7 / -2; Max airspeed: 600 KIAS (Mach 1.6)

Once in the cockpit the training scripts will freeze BMS and setup the systems accordingly.

WEATHER: 0858 Zulu 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 III (IFR) conditions. An interesting aspect of this flight is that the home base and landing base are *not* the same. The flight originates from Gunsan AB to deploy on the USS Enterprise cruising West of the Korean peninsula. As most flights have the same airbase for departure and landing it is generally assumed that the same pre-sets are used for departure, approach, and tower. In this TE, however, the pre-sets are not the same; just as a reminder that pre-sets are just shortcuts. The *real frequency* behind the pre-set really matters. In this flight if Pre-set 4 is selected for talking to approach, Gunsan AB will answer and advise you are not on their radar and thus you will look like a fool (ask me how I know?)

The briefing is the first stop at mission planning. Note that the arrival approach frequency is Pre-set #7.

COMM LADDER:

AGENCY:	CALLSIGN:	UHF [CHNL]:	VHF [CHNL]:	NOTES:
INTRA-FLIGHT:	Spade1	260.500 MHz [15]	141.175 MHz [15]	Flight Management Comms
GUARD:	None	243.000 MHz	121.500 MHz	Distress / Emergency
COMMON:	None	339.750 MHz [14]	119.500 MHz [13]	Advisory / UNICOM
BASE OPS:	None	304.800 MHz [1]	--	Homeplate Operations
TACTICAL:	None	300.750 MHz [6]	--	Package Comms
DEP ATIS:	Gunsan ATIS	--	120.225 MHz	Departure Airbase
DEP GROUND:	Gunsan Ground	273.525 MHz [2]	--	Departure Airbase
DEP TOWER:	Gunsan Tower	292.300 MHz [3]	126.500 MHz [3]	Departure Airbase
DEP DEPARTURE:	Gunsan 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 load all radios and navigation settings. Radios will be set to tactical UHF #6. VHF will be set to the flight's internal comms frequency. Check the following:

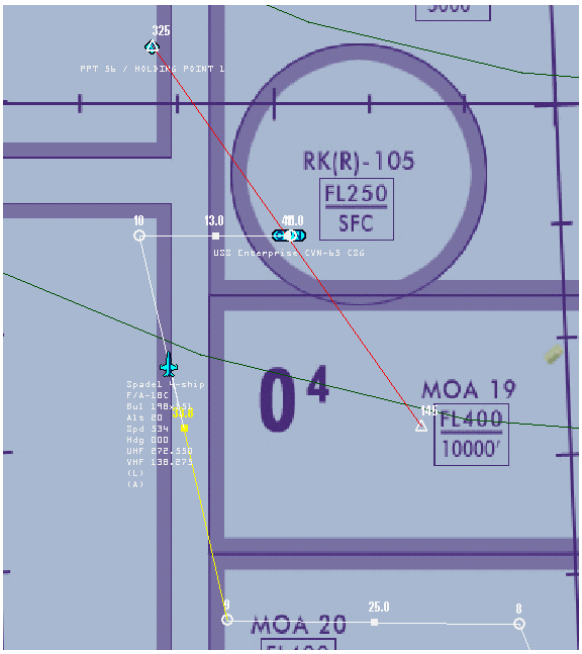
- ✓ TACAN – set to 12X (USS Enterprise)
- ✓ ILS frequency – set to 108.55
- ✓ TCN – T/R
- ✓ HSI – set to TACAN mode (*TILS*).

This training mission is still a day landing but in poor weather. As a refresher, Case III recoveries are made in bad weather or at night. Visibility is therefore not good and landing on a carrier with limited visibility is one of the greatest challenges in aviation!

During a Case III recovery, aircraft flights calling "Inbound Mother" will be *Marshalled* to a different point for holding or to an *Initial Approach Fix* (IAF). The IAF is aligned with the carrier's present course. In this training scenario, the carrier has a BRC of 145° and thus Mother will direct on radial 325 (145+180).

While at the IAF, aircraft are separated by 1000 feet altitude. Referencing back to Chapter 4, the difference in separation of the IAF is calculated with the following rule:
$(\frac{Altitude\ in\ feet}{1000} + 15\ NM)$. (6000/1000 = 6 + 15 = 21 NM).

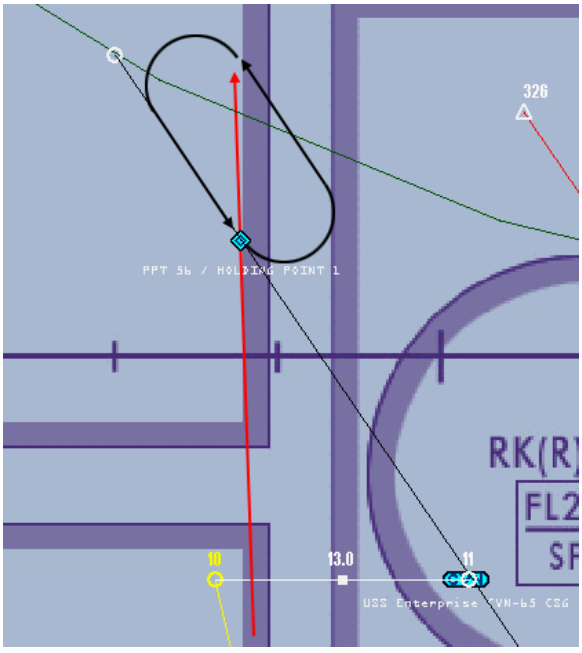
The lowest possible holding altitude is 6000 feet, at 21 NM. From there all other aircraft will be separated by 1000 feet in altitude and 1 NM in distance. Then, one by one, from 6000 feet & 21 NM they will be given a *Charlie* call to start a long straight in approach.



NOTE: Aircraft will remain at their assigned altitude in the hold until they receive their Charlie call. There is no need to descend to 6000 feet.

From the IAF, the approach is rather straight-forward: *Descend down to the carrier on a straight-in approach*. The dynamic IAF holding point tends to make things a bit more complicated. Luckily, Mother will give heading directions after initial contact, just as if flying an instrument approach to an airbase.

To understand the geometry of the IAF, the figure on the right uses the ruler to identify the BRC and its reciprocal. Notice the IAF is due north of the initial position upon entering the TE, and picturing where the IAF is in relation to both the aircraft and the carrier is critical. Attempt to attain a mental picture of this. A good technique to use in the cockpit is to set R-325° on the HSI and fly to the DME point given by Mother.



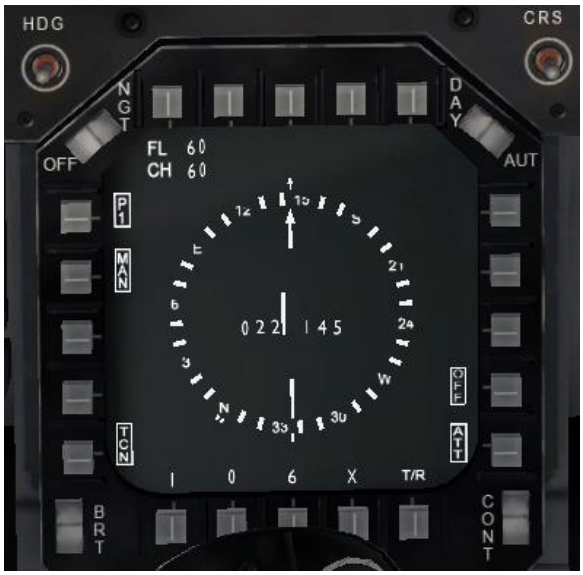
From the perspective of the #4 Hornet in the flight, expect flight lead a little ahead and starting a descent. Acquire him with the FCR and follow him in the descent enroute to steerpoint #9. While on Pre-set #6 use IDM for better SA of the other Hornets in the flight. Lead will eventually call to switch to approach. Select *UHF Pre-set #7*, the carrier approach frequency and Lead will announce "Inbound Mother". Mother will state current weather, Case III recovery in effect and give a Marshal position on R-325° about 21 Nm from the carrier (each flight member should get a different DME and holding altitude). From Spade 1-4's perspective, expect R 325° 24 NM DME at 9000 feet. At this point, the flight is considered separated and deconflicted by distance and altitude.

Mother will issue headings and altitude to each aircraft of the flight. Listen carefully and follow the approach calls while flying to Marshal. A common term used in aviation is "Stay ahead of the aircraft!" This means, think, and expect, what is coming next in the flight. Then, once that next step is in mind, think of the next step after that, and the one after that, so on until landing. Be prepared and *Stay Ahead* by picturing

the holding geometry and entry to the IAF. This may be a good time to dial in 145 into the HSI's course needle.

One thing to consider during this approach is that is rather slow. There is no need to rush. From Space 1-4, being the last aircraft to land, it is conceivable that from "Inbound Mother" to being back on the deck to take 20-30 minutes. And the game code by no means gives any kind of priority. With this in mind, *monitor the aircraft's fuel state*!

Once pass 24 NM DME continue ahead for about a minute to a minute and a half. Start a left turn around to R-325 (145°). This is the holding pattern. Maintain 9000 feet and start a clock or reference the system time. Holdings are 6-minute left-hand racetracks. Inbound and outbound legs are 2 minutes and turns are 1-minute. The 1-minute turn is a standard-rate-turn. That is, 300 KCAS and 45° bank. (Refer to the BMS Comms and Nav book for proper holdings procedures and formulas). Once in the holding concentrate on the timing. At 300 KCAS 2 minutes covers about 10 NM so the other point of the inbound leg should be around 34 NM DME (for Spade 1-4).



NOTE: A standard-rate-turn for a Hornet is 3° per minute. At 300 KCAS this translates to about a 45° angle of bank.

To assist first-timers the planners have placed a PPT and a line to display (approximately) the IAF and the recovery axis on the DTC. It should be visible on the HSD. Keep in mind though that the ship is moving.

Keep the SA high. Listen for flight lead's *Charlie call.* He will depart the holding for *Platform*. Listen for Spade 1-2 & 1-3's *Charlie* call also. Get a feel for calls required when it's 1-4's turn. Lead will report *Platform* (passing 5000 feet) and soon after Mother will issue a Charlie call to 1-2. Once Spade 1-3 is given a Charlie call begin to think ahead and set up to exit the pattern at the IAF.

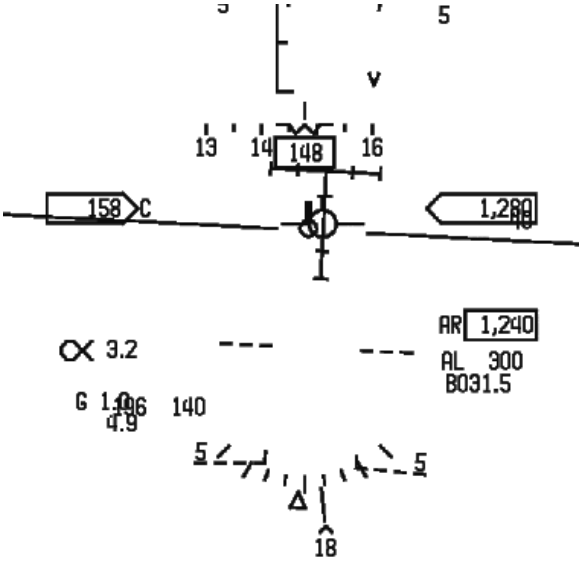
NOTE: The game code tends to give *Charlie* calls to AI aircraft once the preceding aircraft calls *Platform*. For us humans, the code will give a Charlie call once the preceding aircraft has *trapped* on the carrier! So be prepared to stay in holding for a long time! (More than 5 minutes or so!) When 1-3 is safely back on the carrier, expect: "*Spade 1-4 Charlie now: BRC [145°] – Bearing [160°]*"

NOTE: Considering in BMS that BRC and carrier's course are off by 10°, exiting at the IAF will give the best geometry for a straight-in approach

NOTE: The Hornet HSI on the right show's arrival at the IAF after the holding entry for Spade 1-4.

Over the IAF at 9000 feet, start a descent of 4000 fpm. At 5000 feet report *Platform* on the ATC carrier page. Mother will acknowledge and state, "Switch to Tower". Select UHF *Pre-set #8*.

No need to make a call. Decrease the descent rate to 2000 fpm and level out at 1200 feet. At just under 18 NM DME the ILS should pick up the carrier's TACAN signal. DME should be about 10 NM or more.



Use that time to setup the jet for landing and keep good SA on the DME. Refer to the Case III approach plate on page 54 for specific milestones during the approach.

At 10 NM DME, start Landing checks:

- ✓ Airspeed – Set to 250 KCAS
- ✓ Hook – Lower
- ✓ Full – Flaps
- ✓ Navigation Mode – Set to TILS mode
- ✓ Gear – Lower
- ✓ Eventually select the auto-throttle once on AoA.

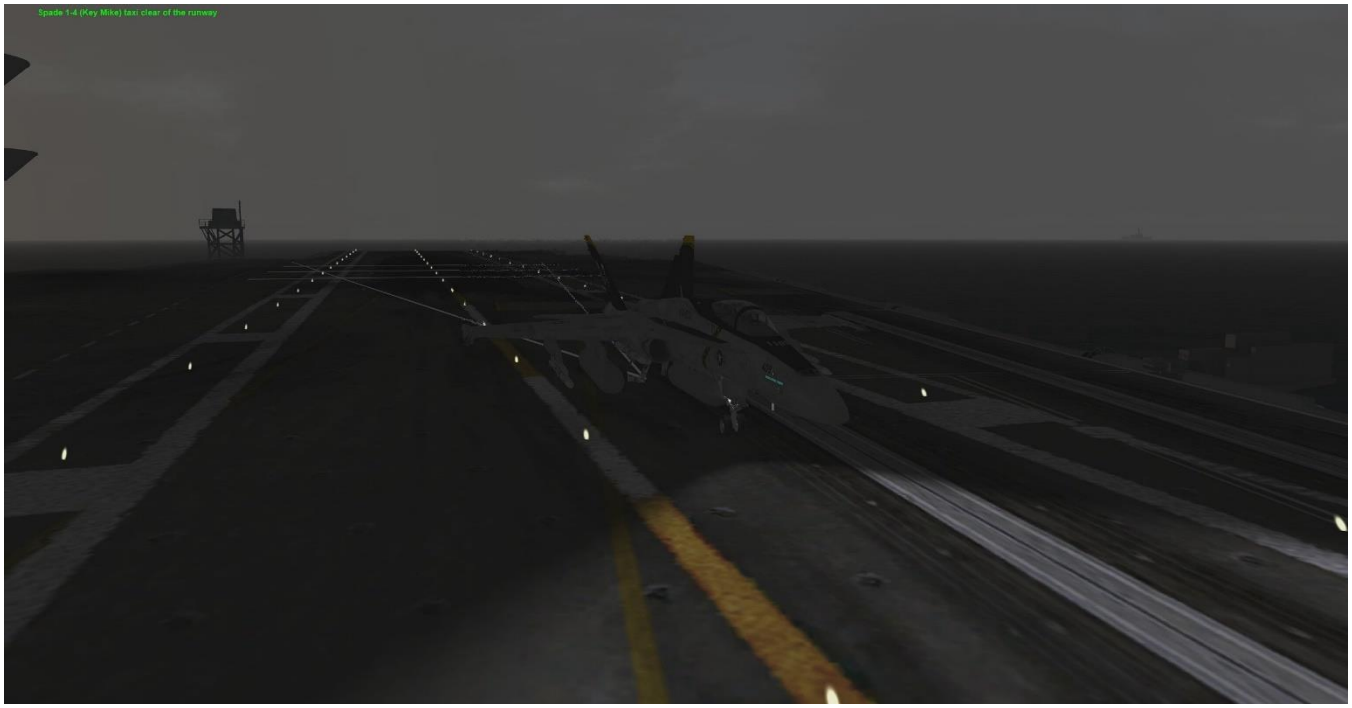
These checks should be all setup no later than 6 NM DME. Expect the needles to come alive around 3 NM DME. Maintain level flight until the glideslope needle comes down.

As always, the glideslope will intercept from below. At 1200 feet expect to intercept the glideslope at about 3¼ NM.

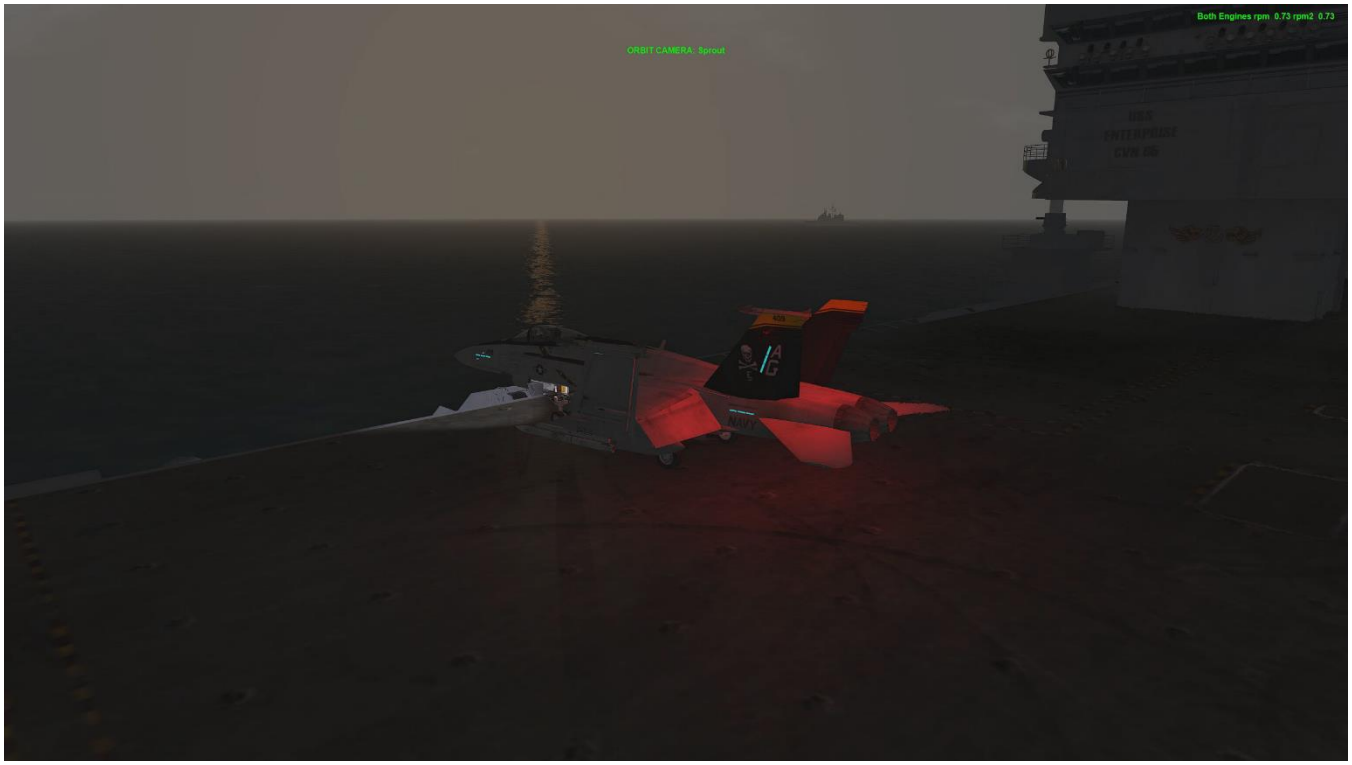
Around 5 NM, the LSO will call for the first time and state, "Fly Your Needles" referring to the ILS bars. As the ILS bars center in the HUD, begin the final descent.

The carrier will gradually come into view at about 2 NM, and at 1½- NM the LSO will say "Paddles Contact!", "Call The Ball". Reply when the *meatball* is visual, listen to the LSO's directions and concentrate on that final approach: *Meatball, Line-up & AoA…Rinse & Repeat*.

Once on the deck, perform after landing checks. Don't delay raising the hook and fold the wings, other aircraft may be landing behind you.



WELL DONE! You are now a Naval Aviator!

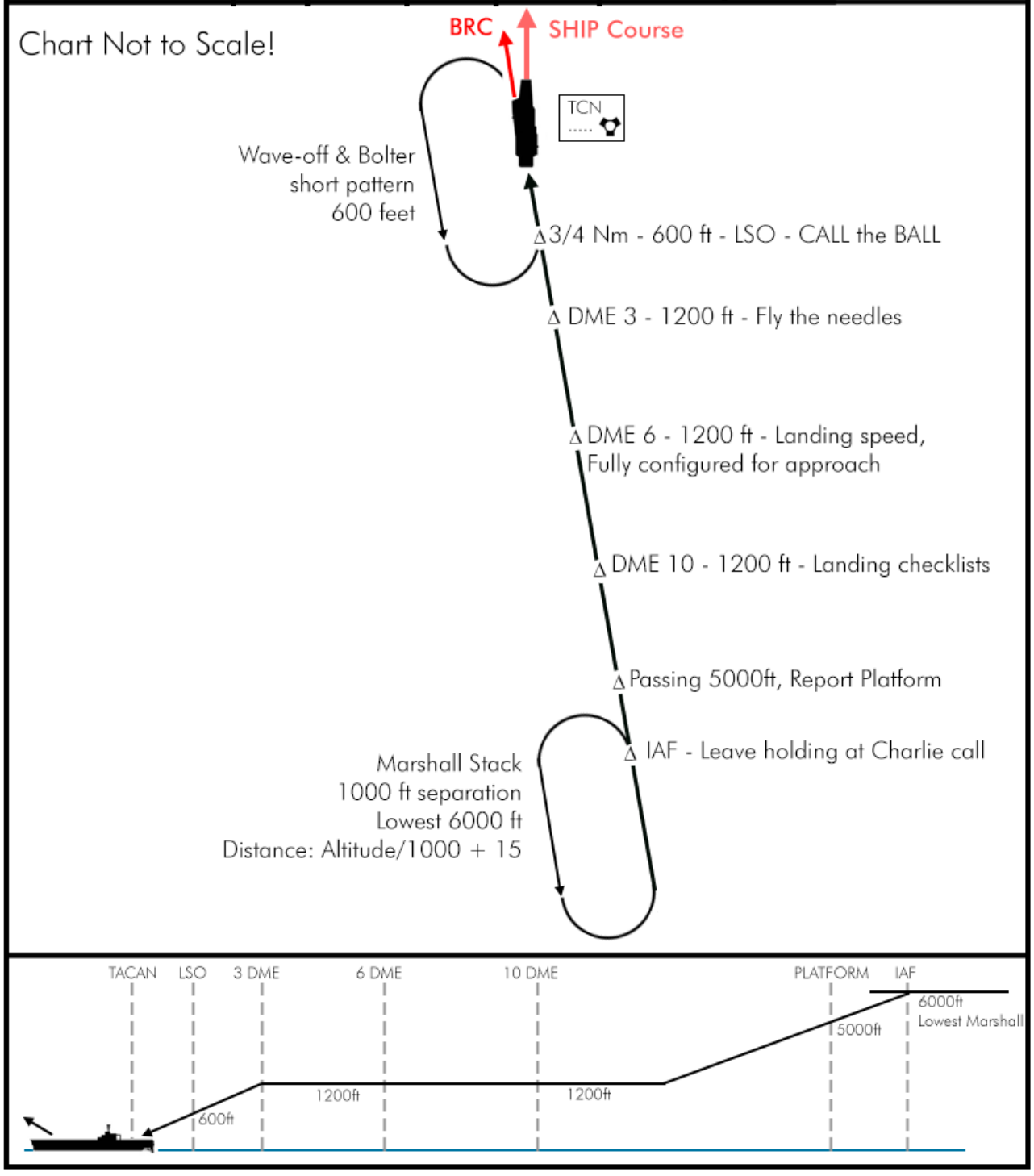


KTO BMS

CARRIER CASE 3 RECOVERY

Update: 12JAN22

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

5.4 Mission 26: AV-8B+ Harrier – 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 highly recommended to assign the nozzle controls to the HOTAS as managing them with the mouse is hardly possible when performing vertical operations.
LOCATION: USS Wasp cruising in the south-eastern portion of the Sea 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 (Mach 0.95)
WEATHER: 0127 Zulu, FAIR, winds from the North, unlimited visibility, calm seas.
GOAL: Successfully trap the aircraft vertically.

The purpose of this training mission is to become acquainted with the Harrier and operations on the USS WASP. If mastering carrier operations with the F/A-18 is complicated, mastering vertical landing is the next level. Be prepared to fly this mission multiple times as there will be a considerable amount of scraping metal while mastering vertical flight. Not to worry, that is why we have training missions. However, if it becomes too frustrating it is recommended to create a simple TE with a Harrier at an airbase. Make a few patterns to a stable spot before attempting a moving spot. MCAS Iwakuni is recommended since it has the helicopter spot markings as on the WASP.

The scenario for this training hop is quite versatile. The plan is to launch from the WASP performing a Short Take-off (STO), strike a ship, fly to MCAS Iwakuni, practise some vertical landings on the VTOL pads and hot-pit refuel the jet. Then to cram even more into the bag, fly back to the USS Wasp to perform a vertical landing. 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.

The Harrier will be parked on the stern, starboard side of the Wasp alongside another couple of AI AV-8B which will launch first.

Set the UHF radio to Pre-set #2 (268.3) and listen for the initial contact from the other flight. Once they are cleared to taxi and enroute to the AI catapult at spot #4, request taxi, remove the chocks and start gently throttle-up, taxiing forward lining up with the centerline.

NOTE: The nose wheel of the Harrier is not as manoeuvrable as the Hornet's, so take care in taxiing.

The gross weight is above 25000 Lbs, so start the STO procedure from as far back on the deck as possible. Plan for spot #7. Only use a further forward spot as a launch position when gross weight is roughly 23000 Lbs.

Once aligned with the centerline, set the nozzles to 50° and set flaps to STOL mode.

NOTE: The position to trip ATC's call to change frequency from ground to tower is near spot #6. This is too far forward based on the aircraft's weight. Feel free to taxi over this spot for ATC's calls, but it is not required.

Hold the brakes (and your breath), increase RPM to 70%. Release brakes and go to full power and maintain directional control along the centerline, accelerating on the deck. (Passing around spot #6, the code will trigger ground to instruct a switch to tower. If challenging your multitasking abilities, go ahead and try that! Otherwise, don't bother.) Reaching the end of the deck, note the airspeed scale come alive on the HUD. Target speed before leaving the deck is about 80 KCAS. With nozzles at 50% and gross weight, the aircraft should become airborne when the wheels leave the deck. There is 60 feet of air buffer before going into the water. Do not stress the AoA to avoid stalling. Focus on a positive rate-of-climb. Retract the gear and fly straight ahead climbing to 600 feet.

Switch to Pre-set #4 and report airborne through the Carrier & LSO page of the ATC menu. Departure will provide proper instructions regardless of whether tower was not contacted. Once the aircraft has a positive rate-of-climb and airspeed under control, turn downwind and start a transition to forward flight by rotating the nozzles gradually to the horizontal (0°). Once the nozzles are horizontal, switch the flaps mode to CRUISE. Set bingo to 3500 to ensure enough fuel to practice at Iwakuni. Now sit back and enjoy the flight to Iwakuni.

Enroute, just before going feet dry (steerpoint #7) there is a cargo ship used as a training target. The standard weapons loadout for this TE is Laser Guided Training Rounds (LGTR), a rocket pod and targeting pod. The laser code is set to 1688. Feel free to spice up the flight by dropping a few practise bombs. Buzz the ship and beaches a bit and maybe even try vertical flight in a large open area.

Select AG master mode, Master ARM to ARM (which wrongly illuminates the air to ground master light in the cockpit). Set the laser page accordingly (code to 1688, combat and lasing time to approximately 15 seconds) and the laser switch to ARM.

With the FCR in SEA mode & TGP will assist in finding the target ship. If the cargo ship is dead in the water, it will not be visible in SEA mode. Select GM mode to acquire it.

After having dropped the LGTRs finish it off with the rockets. They fire all at once and the CCIP pipper is a bit misplaced. Aim the pipper just below the ship.

Once enough fun-time has been "logged", safe-up the jet, and head inland towards Iwakuni AB, Japan. The airbase is a Marine Corps Air Station and features many training aids for Marine Corp aircraft such as the short takeoff runway (Southwest corner of the airbase) and the Vertical landing pads (along the eastern side of the main 02/20 runway).

Set TACAN to 126X & 110.15; and the HSI to TCN mode. The HSI mode knob is just under the UFC on the left instrument panel. The TACAN range should show 100 NM. The signal should be immediately received depending on the altitude. If not, MCAS Iwakuni is steerpoint #9.

A good technique at this point is to recalculate the plane's GW. This is a critical factor in vertical flight. Quickly compute a rough gross weight to ensure the aircraft is below 26000 Lbs. There really is no doubt that the aircraft is below 26000 Lbs if the weapons were dispensed. Keeping good SA on a Harrier's GW at every stage in a sortie is just a good technique to become accustomed with.

Another good technique for vertical flight is to always know the aircraft's *Zero Fuel Weight* (also referred to as ZFW, or "Z-Fuel"). However, some pre-flight planning is required to determine the plane's Z-Fuel. Before entering the 'pit, go into the Loadout screen and using the fuel slider on the right, remove the fuel and take note of the gross weight. This is the Zero Fuel Weight. Once the Z-Fuel is known, it is an easy "public math" calculation to get the gross weight by looking at the aircraft's fuel gauge (which is referenced in pounds of fuel). Also in Loadout, take note of the total munitions weight. This may be subtracted for an updated Z-Fuel once released.

Back to the sortie. Check Iwakuni ATIS on VHF: 128.4 and contact approach on UHF 331.4. ATIS should report runway 02 active with winds from the Northeast, unlimited visibility, and a few clouds at 5000.

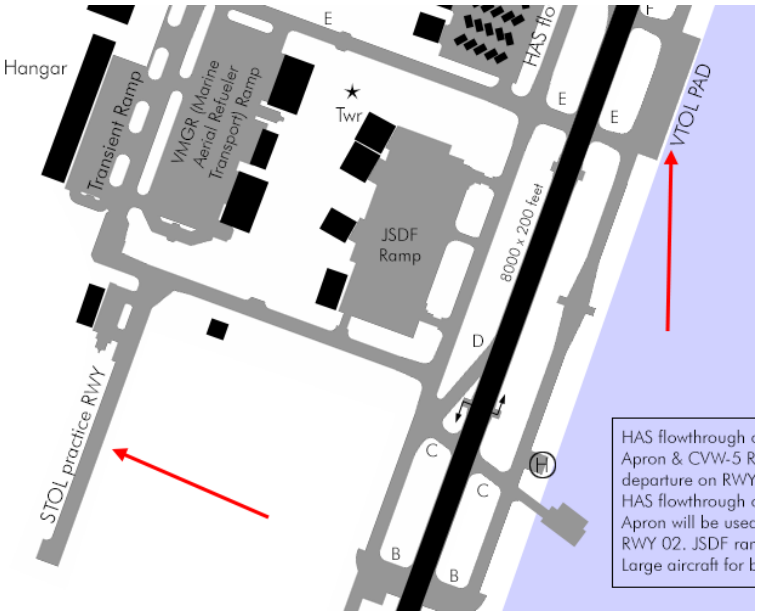
Once inside 30 NM, contact Iwakuni approach and request unrestricted approach.

Before overflying the airbase, set the flap mode to STOL. Check fuel and reset bingo level to 2000 Lbs.

From the north overfly the airbase at 1500 feet and enter a right-hand downwind for runway 02. Continue through the motions of switching to the tower frequency (UHF 299.75) when instructed, contact tower, turn onto final at about 5 NM and notify the tower of final approach.

The procedure for the Vertical Take-Off & Landing (VTOL) pads is to fly a standard pattern to the runway. Except, on final, instead of landing on the "numbers", begin a transition from forward flight to a hover just prior to the VTOL pads.

Slow to 200 KCAS and descend to 600 feet. Maintain altitude and AoA buy gradually rotating the nozzles back. Set nozzles to 60° and lower the landing gear. Once over the threshold set nozzles to 80°. Using a combination of aerodynamic breaking and vectored thrust (overwhelmed yet?), slow to 0 Kts and descend to 50 feet.



As airspeed decreases below 60 KCAS the HUD airspeed tape will drop to 0. To overcome this, select UFC LIST 6 (INS page) to view the aircraft's groundspeed. This will provide invaluable help for hovering. If FPM disappears on the HUD, select DRIFT CO.

Take a moment to get a feel for the controls while hovering. Search for the throttle setting for the current gross weight.

Primarily use the VTOL pad for practicing vertical landings in this scenario. The pad markings are the same as the those on the LHD, so practicing here with a stable hover reference is a great opportunity. Never forget though, the Harrier is very capable to land conventionally on the main runway if frustration levels peak.

Hover taxi to taxiway Echo and land on the first VTOL pad.

Maintain a little bit of forward speed to the VTOL pads and hover abeam the first mark. Pick a visual cue on the left on any airbase landmark and translate to the right with a very gentle stick input till over the mark. A reference on the left is important since the pad markings will not be visible while over it.

Once comfortable with the position control altitude with the throttle. Gently reduce power to settle for a 4-point landing (all 4 gears touching the ground simultaneously).

Welcome to the ground.

If hovering becomes overwhelming power up and go-around. Transition back to forward flight by increasing airspeed and gradually rotating the nozzle back to 60°. Feel free to leave the gear down. The power should be sufficient to maintain forward flight around the pattern. At this point feel free to make an approach to a conventional landing on runway 02. Once stopped on the ground, set the nozzles to 90° throttle-up and try hovering a bit with and without a reference point.

Once thoroughly “hovered”, and willing to continue, taxi to a flow-through hangar to hot-pit refueling. When chocked, extend the aerial refueling probe and request hot-pit refueling from the ATC menu. Stop the refueling once the fuel totalizer hit 6000 Lbs. That should be more than enough for the return trip to the Wasp and allow for a vertical landing with a gross weight under 26000 Lbs. (17000+6000-fuel needed for flight < 26000 Lbs).

Once refuelled, contact ATC and request a departure. Try a short take-off if wishing a new challenge. Reference the steerpoint back to the Wasp. Contact Mother at 30 NM with “Inbound Mother”. Expect Case I & a BRC. (Remember that the USS WASP does not have an angled deck, so BRC is the LHD’s course). Follow the instructions to Marshal and down to the approach just as with a recovery to a carrier. Mother will direct to switch to tower, but this is not important. Landing will be a slow and deliberate hover. So, no need for an LSO.

To break it up into something familiar, perform the standard overhead break at 800 feet and 250 KCAS. On downwind descend to 600 feet and set nozzle to 60° with gear down. Now extend the downwind to about 2-3 NM before turning base as usual. Set the nozzles to 80° and monitor the airspeed. The LSO may report contact, but in this case ignore them and focus on the approach to a hover. Descend to 250 feet and plan for a 110-foot hover. This is about 50 feet above the deck. Again, *Slow & Deliberate*. It's a slow process where constantly monitor the relative airspeed is a must. (Refer to the DED INS page often). Use the nozzle angles to change speed: 80° to advance slowly, 90° to slow down forward speed, 100° to slow down more aggressively or even fly backwards. Also, input gentle throttle inputs to compensate and maintain hover.

Again, practise, and *patience*, is the key. Stabilize a beam the deck with a slight forward airspeed to keep up with the Wasp's speed. Expect about 20 kts. Pick a hover reference on the island. Keeping the forward translation in, input a gentle right roll in to slide right over the deck. This may be rather challenging for some, so an alternative is to just shoot a straight-in approach from astern and make a slow conventional style landing. It may not be terribly realistic, but it serves the purpose of getting onto the deck safely.

Once back on the deck, taxi to a parking position. Well done!

6. PLANNING NAVAL OPERATIONS

Adding and managing aircraft carriers and their air squadrons to a tactical engagement or campaign may be new to some. This guide will help enhance missions with naval assets. Reference the Tactical Engagement chapter in the BMS Manual for more information.

6.1 Step 1: Add Task Force

- In the TE Editor decide which team or side will own the ship and its aircraft by clicking the flag icon.
- Select the ship icon to place a naval unit. 
- In the ADD NAVAL Window,
  - Select the country under the *Equipment* drop down list.
  - Select the carrier from the *Unit Type* drop down list.

NOTE: 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. By default, the carrier follows a predetermined octagonal pattern. This can be changed to a custom pattern via Mission Commander

6.2 Step 2: Add Squadron

- Click on the *Add Squadron* icon
- Click on the carrier icon or an airbase on the map.
- The ADD SQUADRON window will appear.
- Choose the aircraft type and the task force as an airbase. Use either the Add Flight or Add Package button. The task force will be listed in the AIR BASE list as the very last selection.

NOTE: The naval task forces that are created will *always* be listed as their task force number and the last air base in the AIR BASE drop down menu.

- Basically, as soon as the task force is created everything acts as if the carrier was a regular land airbase.
- If removing the carrier, be sure to first delete any flights based on it in the ATO, then delete the squadrons, then delete the carrier task force.

6.3 Add Flight

FLIGHT PLANS

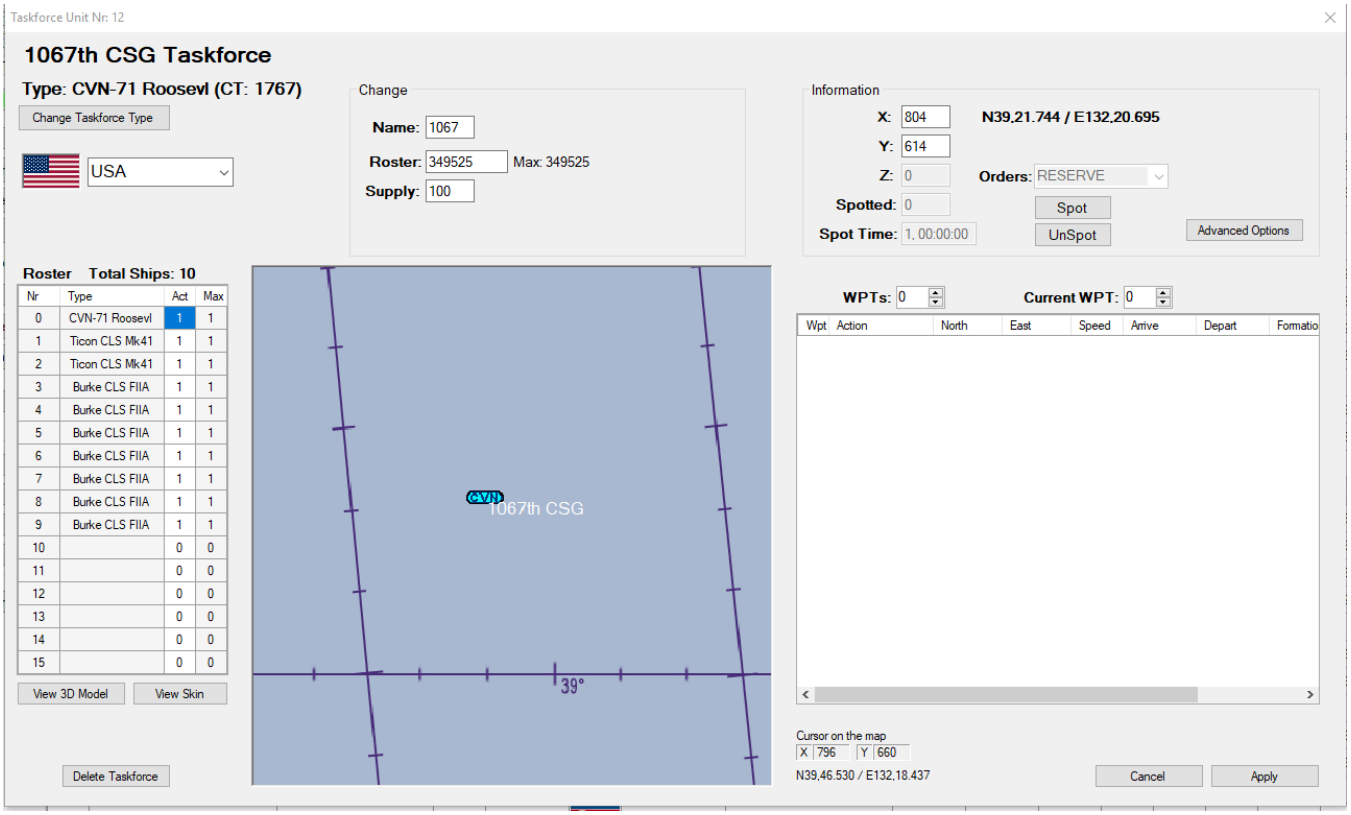
- Click on the *Add Flight* or *Add Package* icon.
- Click on the desired flight destination
- In the pop up-window select
  - Aircraft type
  - Role
  - Flight size
  - Squadron (remember the squadron number)
  - If the Squadron on the carrier is selected, then the "Air Base" should self-populate as the Carrier TF.
  - Skill & Start at Take-off (Or if it is a support aircraft feel free to start over the target).

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.

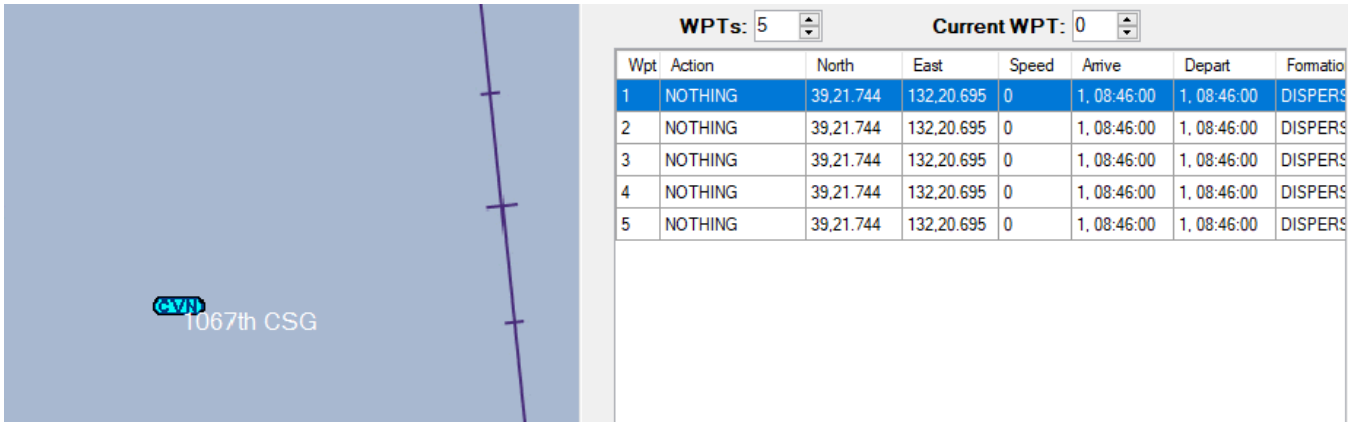
6.4 Editing with Mission Commander

Assigning a specific route to a carrier can be done in Mission Commander (MC). The latest version can be found on the Falcon BMS Forums or at Weapons Delivery Planner website. Once downloaded, unzip it in its own folder and open.

Open the TE with MC and go to the Units tab. Select the Task Force button on the left side and double click on the CVN task force from the list. Right-clicking on the carrier on the map tab and selecting "Edit" will also bring up the following window.



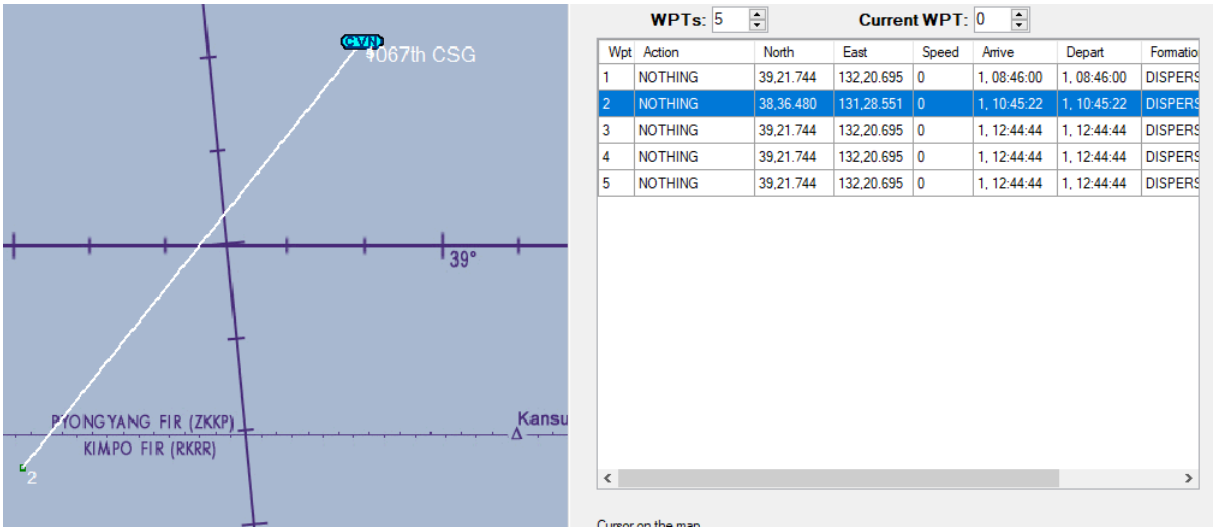
Once in the edit window, notice that the task force does not have any waypoints assigned. The WPTs box and Current WPT box both default to zero. The one exception is in a campaign the carrier will follow a set course assigned by the campaign engine.



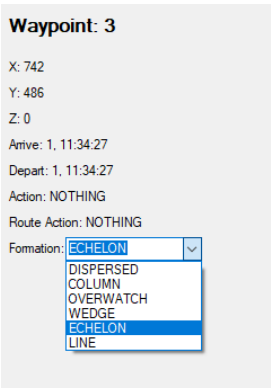
To create a route, click the up-arrow next to WPT's to add waypoints. Create as many steerpoints as desired.

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.

Waypoint 1 is the initial position of the task force. With this WPT selected and right clicking around the map will move the task force's icon and this its initial position. Place the task force wherever is wished.

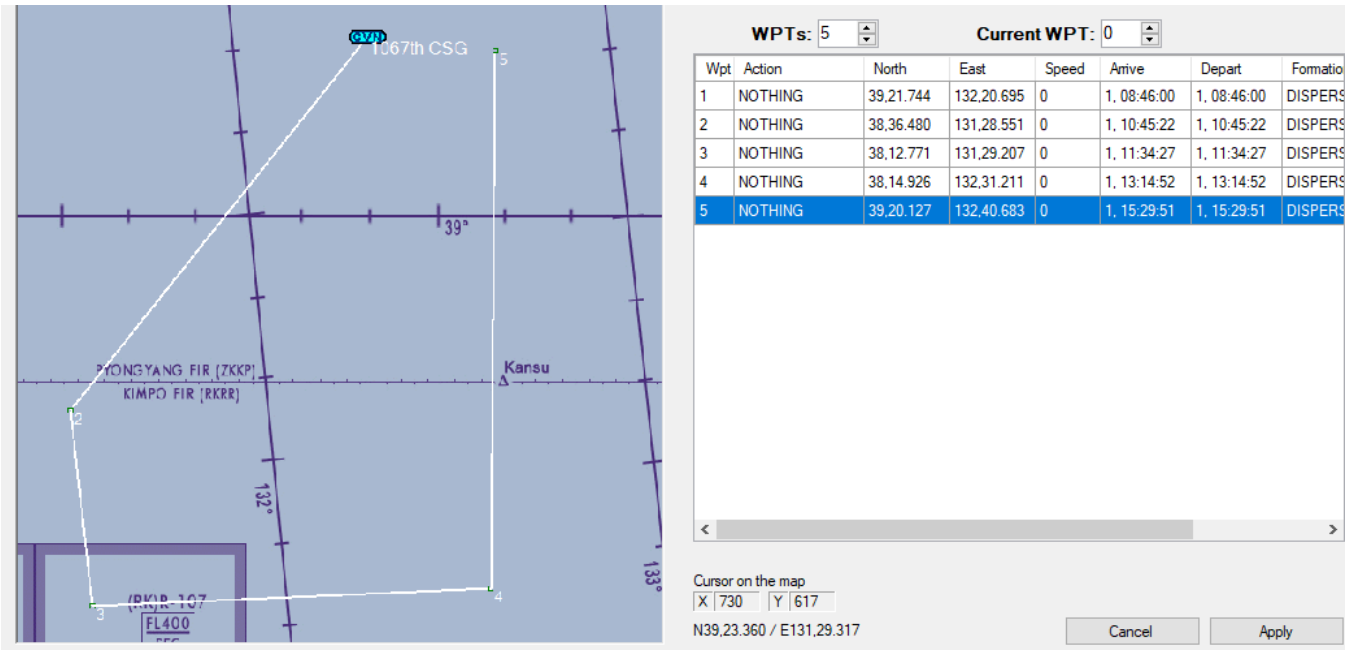


To change the waypoint location, select the waypoint to change. In this example select Waypoint 2 by clicking on the second line to highlight it in blue. Simply, right click on the map at the desired position. A small green square will appear on the map at the location and a white line will be traced for the route of the task force. Repeat the sequence for all steerpoints in the list for a specific patrol area for the whole task force.



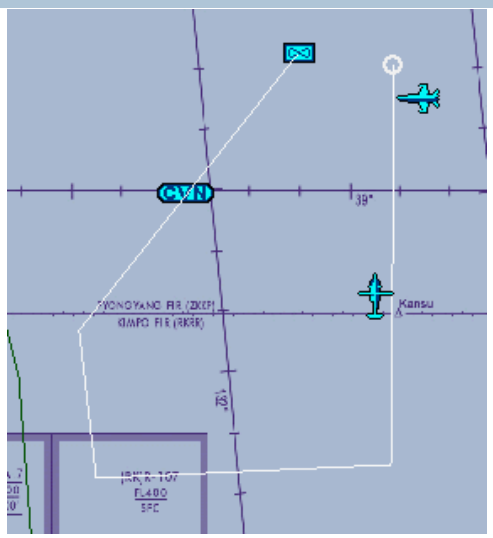
One thing to keep in mind is do not place the carrier too close to shores, as they will by default sail in a square pattern and may run the risk of running aground.

Besides the route, the only other variable is the formation of the task force. If desired just double-click on the waypoint line and use the drop-down menu to modify the formation. Click apply when done.



Once the route has been completely created click the apply button and save the TE. Closing Mission Commander and open the TE up in Falcon.

Now click on the carrier group in the TE editor and note the new route of the task force on the UI map. The carrier will follow this route while the TE plays out. From the picture below, the aircraft in flight should find the carrier back at the end of their flight plan.



7. GLOSSARY

AFM:	Advanced Flight Model
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
Bow:	Front end
BRC:	Base Recovery Course. ○ Carriers: The heading of the landing deck during aircraft operations (Minus 10° from the carrier's heading). ○ LHD: The course of the LHD
Case I:	Day-VFR recovery procedure
Case III:	IFR or Night recovery procedure
Charlie:	Brevity for directing aircraft to begin their approach procedure.
CTO:	Conventional Take-Off
CV/CVN:	Aircraft Carrier/Nuclear Aircraft Carrier
DME:	Distance Measuring Equipment
FPM:	Flight Path Marker
GW:	Gross Weight
Groove:	Final approach course
IAF:	Initial Approach Fix
ILS:	Instrument Landing System
JDB:	Jet Blast Deflector
KCAS	Knots Calibrated Airspeed
Launch:	Take-off
LHD:	Landing Helicopter Dock (Assault ships)
LSO:	Landing Signal Officer
Marshal:	The area where aircraft hold in preparation for approach
MC:	Mission Commander
Mother:	Brevity for the carrier (or surname for the mother ship)
MCAS:	Marine Corps Air Station
NWS:	Nose Wheel Steering
Paddles:	LSO callsign. (Basically, the tower for carrier landings. Comes from the time of antiquities when LSO's used paddles).
Platform:	The point in a Case III approach, at 5000 feet MSL, all aircraft will decrease their rate-of-descent to less than 2000 feet per minute and continue let-down to a 10 NM DME fix.
Port	Left side
PriFly:	Primary Flight Operations Control: Callsign of the carrier tower frequency (This is not currently coded in BMS. Rather the *Mother* callsign is used).
Recovery:	Landing
RWR:	Radar Warning Receiver
Starboard	Right side
Stern	Aft end (also known as the *fantail*)
STO:	Short Take-Off
STPT:	Steerpoint
TE:	Tactical Engagement
Trap:	A successful recovery on the 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