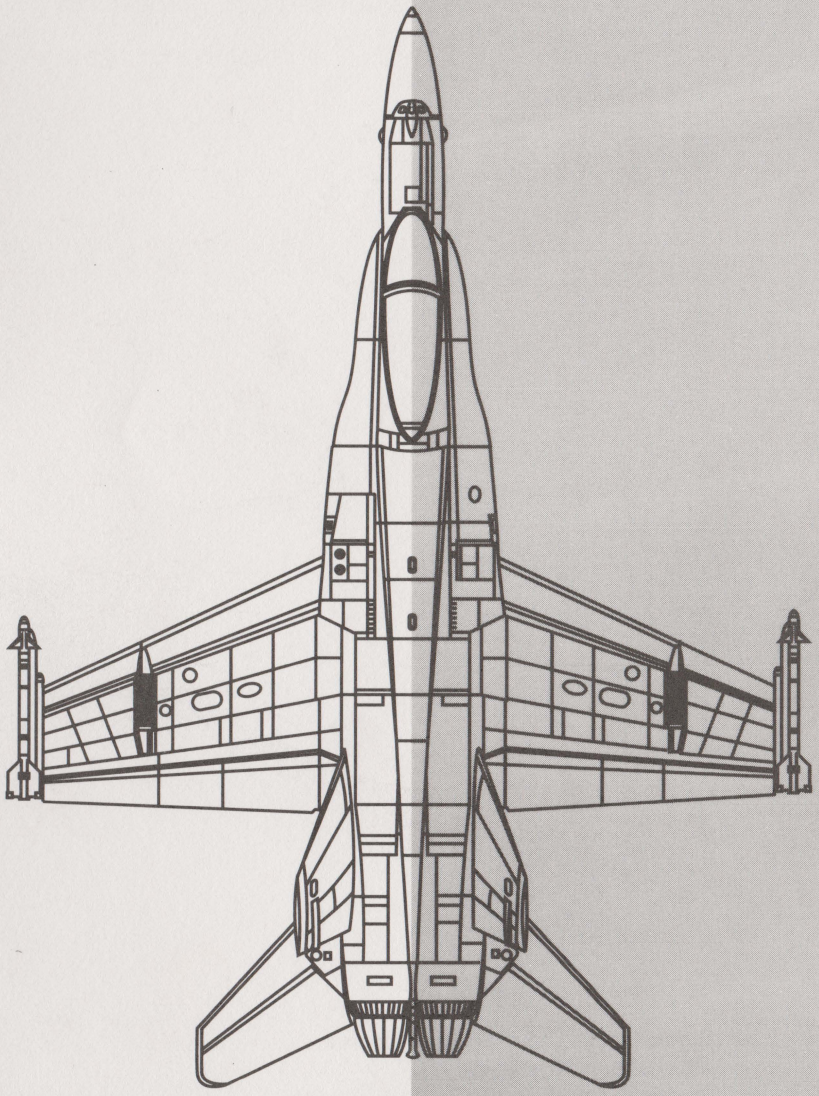
HORNET BRIEFING FOR MIG-29 PILOTS



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1. Adversary briefing: F/A-18 Hornet

The global strategy of the United States is based upon its ability to apply military force wherever necessary at short notice. A key element in this strategy is the U.S. Navy's aircraft carrier task forces, which can bring tremendous air- and sea-based firepower to bear on almost any location within days.

An integral part of the carrier group's striking power is the F/A-18 Hornet, a true multirole fighter-bomber. The Hornet is one of the first opponents you will face in any conflict involving the United States or its allies.

Accordingly, it is essential that you understand the workings of this plane intimately. Know your enemy.

The *Hornet Flight Manual* accompanying this briefing outlines the capabilities of the Hornet in reasonable detail, but presupposes a certain knowledge of American military aircraft systems. This briefing is designed to fill in the gaps.

The areas covered by this briefing are:

Threat warning systems: The F/A-18 has a threat warning system that identifies not only the location of a threat, but the type of threat as well. Study this section closely to understand the radar evasion techniques you will face when you battle Hornet pilots.

Radar targeting systems: The targeting systems on the F/A-18 are comparable in many ways to those on the MiG-29. The primary differences are superior air-to-ground avionics and a lack of any infrared tracking ability.

Anti-radar strike capabilities: The Hornet can carry the HARM and Shrike anti-radar missiles,

and has a specialized targeting system to deliver them. The F/A-18's SEAD (suppression of enemy air defenses) capabilities are detailed in this section of the briefing.

Other important features: This section details the stores control system and the angle of attack system in the Hornet, which are different from those in the MiG-29. In addition, some of the F/A-18's specialized strike missions are outlined.

Armament: This portion of the briefing describes the capabilities and limitations of the most common weapons available to the Hornet.

2. Threat warning systems

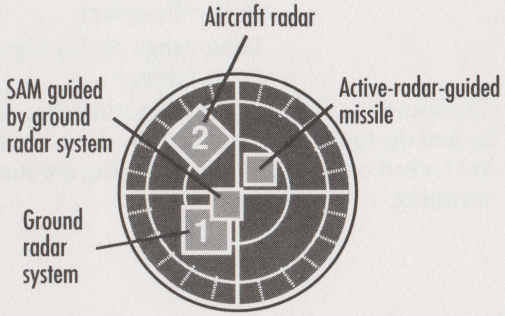
The F/A-18's threat warning indicator (TWI) displays the relative bearing of radar emitters (aircraft, SAMs and radar-guided missiles). The TWI is arranged in a god's-eye view, with the nose of the Hornet facing the top of the TWI screen. Any blips in the upper hemisphere of the screen are in front of the plane, and any in the lower half are behind it. Likewise, blips on the right of the display are to the right of the plane and those on the left are to the left.

This is a passive receiver system. It only illuminates if an enemy radar is directed at the Hornet.

Identifying threats

Different types of blips can appear on this screen.

- Diamond – aircraft radar
- Large square – ground-based radar
- Small square – active-homing radar-guided missile
- Small square overlapping large square – surface-guided SAM



The number within the TWI blip indicates the type of radar. The radar types and their corresponding numbers are:

Aircraft radar

Number	Radar Type
1	Multiple tracking, look-down shoot-down radar
2	Single target tracking radar
3	Continuous wave radar
4	Targeting radar
5	Attack radar
6	Early warning (EW) radar

Ground-based radar

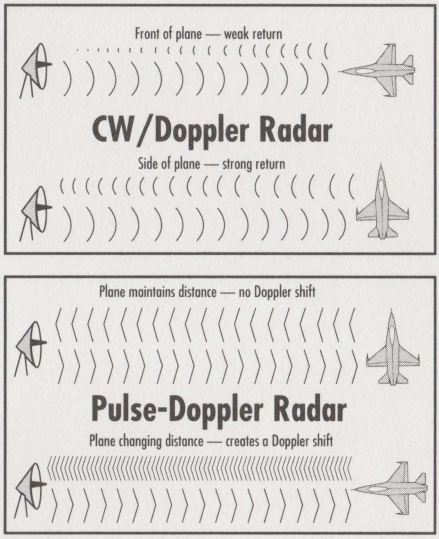
Number	Radar Type
1	Short-range SAM fire control radar (continuous wave)
2	Short-range SAM fire control radar (pulse-Doppler)
3	AAA fire control radar (continuous wave)
4	Long-range SAM fire control radar (pulse-Doppler)
5	Long-range search radar (pulse-Doppler)
6	Long-range multipurpose radar (chirp)

The location of the blip tells whether that radar is locked on to the Hornet. Blips in the inner ring are locked on; blips in the outer ring are merely scanning.

Radar types and evasion

The two basic types of radar are pulse-Doppler and continuous wave/Doppler (CW). Different techniques are required to evade each type of radar.

CW radar detects targets based on the size of the radar return and is thus harder to escape. When flying directly towards a CW emitter, a pilot minimizes the CW radar return by presenting the smallest possible cross section.



Pulse-Doppler radar detects targets based on their speed relative to the radar. "Beaming" the radar is a technique where a pilot flies perpendicular to the radar. The aircraft's relative speed is then so low that radar lock is broken.

The Hornet pilot has the advantage of knowing which type of radar is locked on just by looking at the TWI.

If, for example, the display shows a type 2 square blip in the inner circle, the F/A-18 driver knows that a pulse-Doppler ground-based short-range SAM fire control radar has locked on. By turning perpendicular to the radar beam, the Hornet pilot has a good chance of breaking the radar lock.

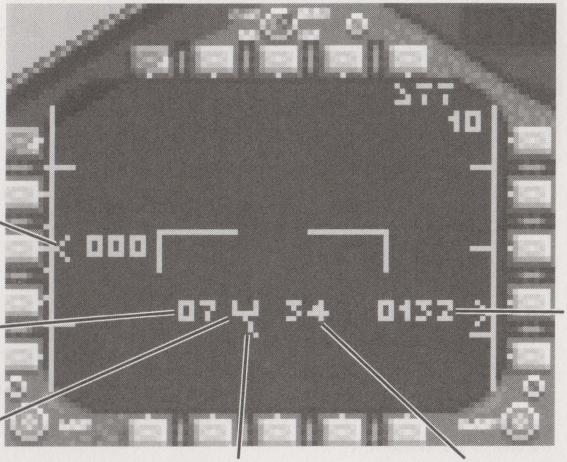
3. Radar targeting systems

The targeting systems in the Hornet will not be entirely foreign to the MiG-29 pilot. Form follows function, and the two aircraft share many similar tasks. There are, however some significant differences. For additional information, see Chapter 9: Radar in your *MiG-29 Reference Manual* and Chapter 3: Multifunction Display Group in the *Hornet Flight Manual.*

Air-to-air

The Hornet targeting system does not include any sort of infrared tracking. Passive interception is only possible if the F/A-18 pilot turns off the radar and selects an AIM-9M or AIM-9P missile as the active weapon. The seeker head on the missile will then track solely by heat, without aid from the targeting system.

Despite this failing, the Hornet's air-to-air radar is more than adequate. The symbology differs slightly from that used in the MiG-29, but the information available is similar.

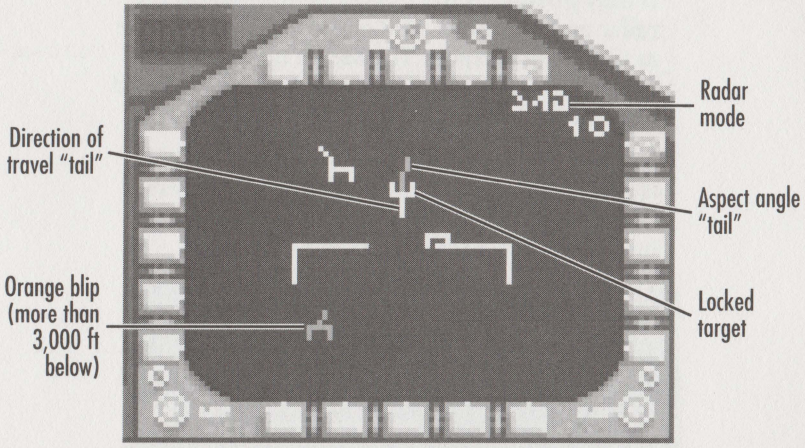


Contacts are shown as inverted "U"s, with the locked target appearing as an upright "U."

The aspect angle is shown by a "tail" which resembles the tails seen in SAD mode. The difference is that this is the exact opposite of the SAD "tail," since it extends forward (not backward) from the target to show the aspect angle to that target.

Situational awareness display (SAD)

Hornet's version of SAD functions almost exactly like *MiG-29*'s. The only real differences are that it shows less information and displays that information in different ways.

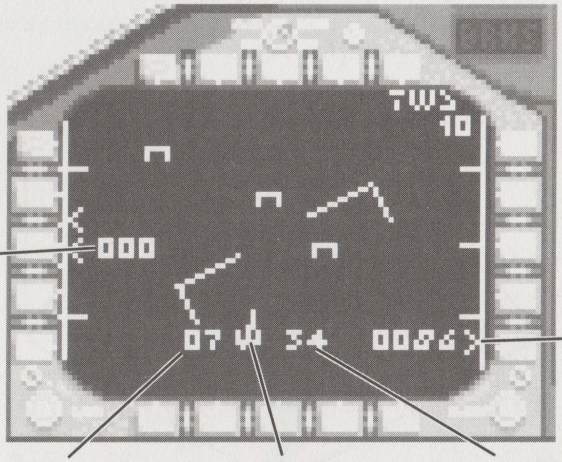


The current radar range is displayed in the upper right corner of the display. Immediately above and to the left of the range is the radar mode ("SAD").

The *Hornet* SAD display color-codes every contact. An orange blip is more than 3,000 ft below you. A blue blip is more than 3,000 ft above you. A white blip is within 3,000 ft of you (either above or below).

Situational awareness model (SAM)

The TWS radar mode in *Hornet*'s SAM model can be equated to the SWT mode in *MiG-29*'s SAM model.

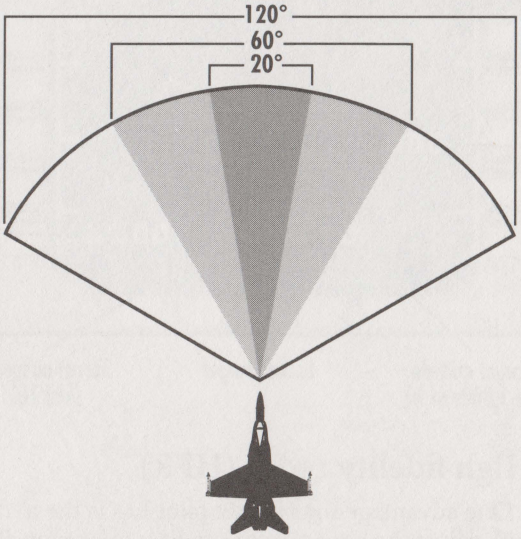


High fidelity radar (HFR)

One advantage the Hornet pilot has is the ability to adjust the scan area of the F/A-18's radar. Both the azimuth and elevation scans can be adjusted to suit the pilot's needs. A narrower scan area will provide more rapidly updated information, while a wider scan area will provide greater coverage.

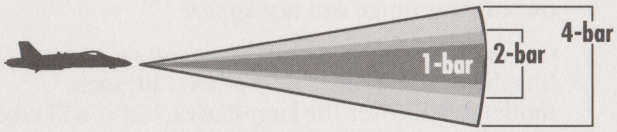
Adjusting the azimuth and elevation scans

The Hornet's radar antenna scans in two directions—horizontally and vertically. The horizontal scan, called the azimuth scan, is controlled by pressing F9. The F9 key cycles through three azimuth scan angles: 20°, 60° and 120°.

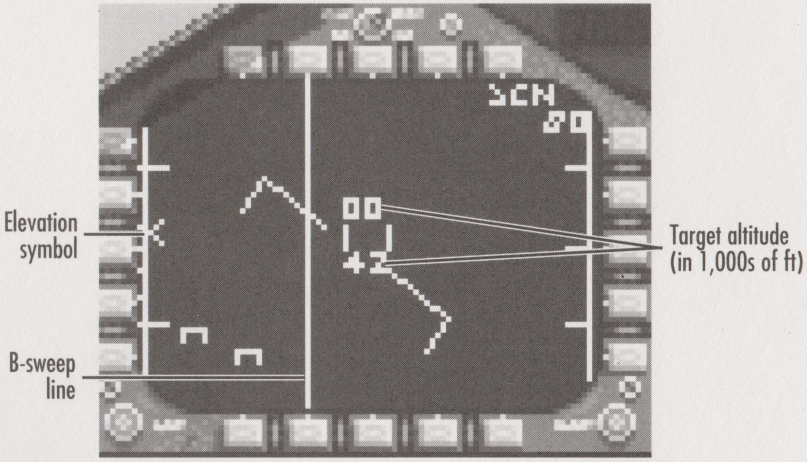


The change in scan angle is reflected in the B-sweep line. At a 120° scan angle, the B-sweep line crosses the entire screen. At 60°, it crosses only the middle half. At 20°, the B-sweep line moves rapidly back and forth across the center sixth of the screen. If a target does not fall within the scanned range, it will not appear on the radar screen.

A *Hornet* pilot can also set the vertical or elevation scan. The radar will scan back and forth, and either stay on the same line or move vertically after each scan. Pressing F10 will cycle through 1 bar, 2 bars or 4 bars of elevation scan.



In 1-bar mode, the radar scans left and right without moving up or down. In 2-bar scan, the radar scans to the right, drops down vertically a few degrees, scans left, moves up a few degrees, and continues this pattern. In 4-bar scan mode, the antenna scans right, drops, scans left, drops again, scans right, drops, scans left, and then moves up to the original scan line.



The antenna elevation symbol on the left side of the display shows the elevation scan. The symbol moves up or down one step when the radar changes bars. For example, if the elevation symbol cycles through four different positions, the radar is in a 4-bar scan.

Two numbers above and below the acquisition cursor display the elevation range. The top number is the lower elevation limit, and the bottom number is the upper limit. For example, if the readout shows "05 25," this means that the radar is scanning from 5,000 feet to 25,000 feet. Targets outside this range will not appear.

Contacts are updated only when the radar scan hits them. If the radar is in 4-bar/120° scan mode, it will cover the largest area, but it will take several seconds to update each target. If the sweep area is reduced, contacts in that area will be updated much more rapidly.

Radar modes

The four modes in *Hornet*'s HFR mode roughly correspond to the four HFR modes in *MiG-29* as follows:

Hornet radar mode	Matching *MiG-29* radar mode
SCN	SCN
TWS	SWT
STT	TRK
ACM	IRST

SCN mode

Hornet's SCN mode is adequately explained in the accompanying *Hornet Flight Manual.* It operates almost exactly like the MiG-29's SCN mode, with the exception of the adjustable scan area as discussed earlier.

TWS mode

TWS mode is equivalent to the MiG-29's SWT mode. One target is locked up, while the radar continues to scan the area for other targets. The azimuth and elevation scan settings discussed

above still apply. *Hornet* pilots can enter TWS mode by selecting a target in SCN mode and pressing [Z].

STT mode

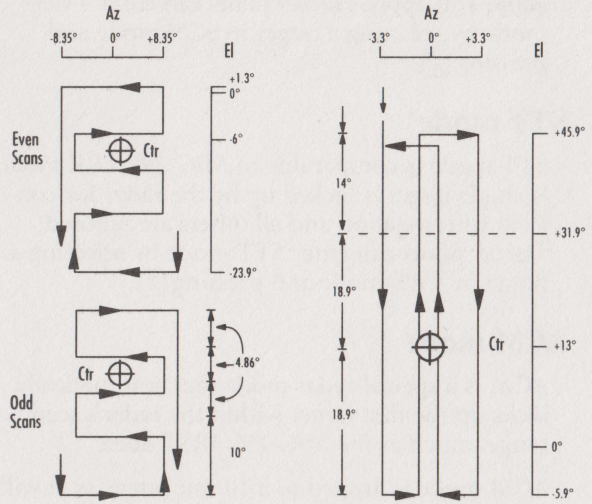
STT mode is comparable to *MiG-29*'s TRK mode. A single target is locked up by the radar for constant interrogation and all others are ignored. *Hornet* pilots can enter STT mode by selecting a target in TWS mode and pressing [Z].

ACM mode

ACM is a special radar mode that automatically locks up the first target within the radar's scan range, much as the MiG-29's IRST does.

ACM mode is limited to a 10 nm range, so it will detect and lock up targets that are an immediate threat. ACM mode is essentially the same as STT, but the range will always be 10 nautical miles and targets will be locked up automatically. The radar mode switches from ACM to STT as soon as the target is locked up. *Hornet* pilots can select ACM mode by pressing [F6].

There are two scan patterns in ACM mode. The first scans a 20° wide by 20° high area, while the second scans a 10° wide by 40° high area.



A. Scan for 20° x 20° Mode

B. Scan for 10° x 40° Mode

The 20° by 20° scan is angled slightly downward, so it is used to spot targets below the Hornet. The 10° by 40° scan is angled upward, and is therefore used to find targets above the aircraft. The default ACM scan area is 20° by 20°. When the 10° by 40° scan is in use, a vertical line appears on the HUD as a reminder.

Air-to-ground

The Hornet has two air-to-ground DDI modes that may be unfamiliar to the MiG-29 pilot. The Maverick display shows the locked target of a fire-and-forget optically guided weapon such as the AGM-65B Maverick or GBU-15 guided bomb. The ground map radar shows the location of known installations and the current mission target.

Maverick display

This mode is used with the AGM-65B TV-guided Maverick missile and GBU-15 guided bomb. Cross hairs appear in the DDI when the F/A-18 pilot selects either of these weapons (assuming one of the DDIs is already set to Maverick mode).

When either of these weapons locks on to a target, the cross hairs on the HUD "stick" to the locked target (just as they do with the Kh-23 in the MiG-29) and a magnified image of the target will appear in the DDI. The Hornet pilot can manually switch targets by pressing [T] and can fire the missile or guided bomb by pressing [Spacebar] or pulling the trigger.

See the *Armament* section of this briefing for further details on the Maverick and GBU-15.

Ground map mode

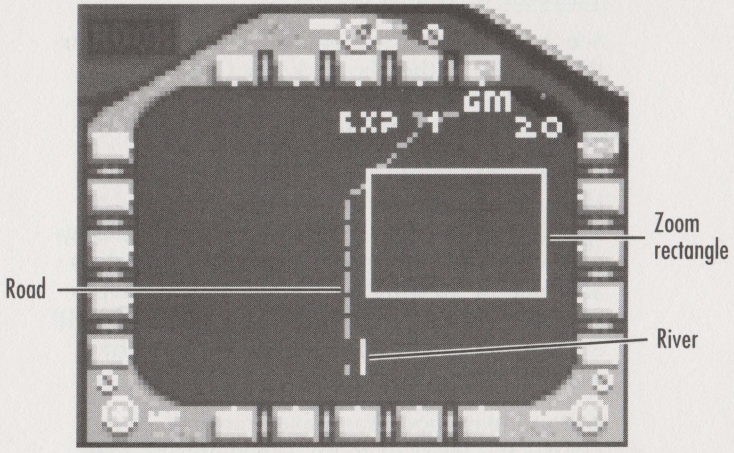
Ground map mode is used to determine the Hornet's position, to help locate targets and to spot landmarks like roads, rivers, lakes, buildings and bridges. The Hornet's ground map mode is activated by pressing [F7] with one of the DDIs set to display the radar. Pressing [F5] or [F6] will exit ground map mode and bring up SCN or ACM mode, respectively.

Ground map mode has a fixed range of 20 nm, but has five levels of zoom. When ground map mode is activated, the radar will scan the terrain in front of the aircraft and display a representation of it. Some features can be identified by color and shape. For example, bright green lines are rivers and dim green lines are roads. Buildings appear as dots until they are very close. Ground map mode also shows runways.

The square in the center of the ground map display is your guide for zooming in. When the pilot presses [F1] (zoom in), the area inside the square fills the entire display. Normal ground map mode

is 1 to 1. The display can show 2x, 4x, 8x or 16x magnification. Pressing [F2] zooms back out. The expansion value appears in the upper right corner of the radar screen.

The zoom rectangle can move around in the radar display to zoom in on areas that are not directly in the center. Pressing [Shift] in combination with the movement keys ([I], [J], [L] and [M]) moves the zoom rectangle to a new position. There are nine possible display positions: three across and three down. Once the zoom rectangle is on the area of interest, pressing [F1] will magnify it to show the desired detail.



Any target selected in the waypoint screen will appear with a diamond or have cross hairs over it on the radar when it becomes visible. The target bearing and distance will appear in the lower left quadrant of the radar display.

Pressing [Y] toggles roads and rivers on or off in the Ground Map mode. Turning roads and rivers off may substantially speed up performance.

4. Anti-radar strike capabilities

As a multirole strike fighter, the Hornet has some weapons and missions available to it that the MiG-29 does not. In particular, the F/A-18's ability to deliver two types of anti-radiation missile enables it to carry out suppression of enemy air defense (SEAD) missions.

SEAD missions

SEAD missions can be flown in support of another task force or independently as part of a campaign to destroy enemy anti-aircraft weapons. Setting up and carrying out supporting SEAD flights is discussed later in this section. On an independent SEAD mission, the "Wild Weasel" flight will have more resources available and its tactics will not be limited by those of another strike force.

The main weapons the Hornet carries for hunting SAMs and AAA are its TWI (discussed earlier) and its HARM and Shrike anti-radiation missiles.

SEAD action code

SEAD is also the name of a waypoint action code designed specifically for air defense suppression missions. The action is similar to S AND D or CAS, but instead of attacking any type of ground unit, the flight will focus its attacks on anti-aircraft weapons and radar systems. The flight will use any air-to-ground weapons that it has, not just the HARM or Shrike anti-radiation missiles. These missiles are the best weapons for the job, but if the mission is to suppress the air defenses near the target in support of an air strike, the SEAD flight should carry additional weapons.

There are two distinctly different types of targets against which SEAD missions can be flown: permanent SAM sites and mobile land-based SAMs and AAA. The SEAD action code can be used to set up an attack against any of these targets.

Permanent SAM sites and radar installations

Missions against permanent installations can be flown using the standoff attack method and HARM missiles. The key to success is for the SEAD flight to stay low and to avoid any concentrations of smaller anti-aircraft defenses on the way to the target. When within range of the target, the SEAD flight might have to pop up to induce the enemy radar operator turn on his radar so that the anti-radiation missiles will have a signal to home in on. Then it's a race to see who can get the missiles off first.

The SEAD aircraft have a slight advantage in this game because their missiles are fire-and-forget and because the radar site can't maneuver. After destroying the radar of a permanent SAM site, the SEAD flight will often close in and destroy the missile launchers for good measure—but short-range SAMs and AAA at the site can make that a risky move.

Mobile land-based SAMs and AAA

Mobile land-based SAMs and AAA are used both for point defense of valuable military and civilian assets and to overwatch moving troop and supply convoys. As a point defense, the anti-aircraft weapons will be scattered around a site. To destroy them, the SEAD aircraft must wait for them to turn on their radar before the HARM or Shrike missiles can be used.

If the SAM operators refuse to turn on their radar or have none, the SEAD flight is forced to

hunt them down one by one with Mavericks, bombs, LAUs or guns.

When anti-aircraft weapons are protecting a moving convoy, they are usually deployed within the convoy itself. In such circumstances, the air defenses are usually easy to find.

A-R HUD mode

This HUD mode is used for the AGM-45A Shrike and AGM-88A HARM anti-radiation missiles. These missiles detect the radar emissions of a SAM or AAA site and lock on to its radar. They then follow the radar beam in and destroy the site. These weapons, like the Kh-23 or Maverick missiles, are fire-and-forget—once fired, they are self-guiding.

The difference between them is that the Shrike has a range of 12 nm and will only lock on to a continuous wave (CW) radar whereas the HARM has a range of 30 nm and will lock onto either a pulse-Doppler radar or a CW radar. See *Armament* later in this briefing.

When an anti-radiation missile is selected, the Hornet's HUD changes. It looks just like the Maverick mode, but behaves slightly differently. If there is a ground-based radiation source in front of the plane, the cross hairs will automatically slide over to it and lock on.

This lock will be maintained as long as the target emits radiation and stays in front of the Hornet; it does not have to remain visible in the HUD.

Sample mission

In Red Flag, you will find a mission setup that duplicates a simple SEAD mission for the Hornet. Load LESSON7A.

The Hornet begins the mission at about 3,000 feet, heading due north (0°). Start pointing its

nose earthward and look for some brown specks on the ground. That's a tank park with some mobile SAM batteries.

Hit [Backspace] until "45A" appears in the HUD. This means a Shrike is the selected weapon. Notice how the cross hairs automatically track to the nearest radar-emitting target. That's the main HUD difference between these missiles and the Mavericks.

Right now, the aircraft should be at about 2,000–3,000 feet. Once a target is acquired (when the cross hairs move to a radar-emitting target), fire by pressing [Spacebar].

With a HARM, a Hornet pilot can be a lot farther away from the target before firing because of its long range. Circle around again and take another shot if the Shrike missed.

5. Other important features

Stores control panel (SCP)

The SCP is the *Hornet* pilot's indicator of what weapon is currently loaded and available to fire.

The first line in the SCP indicates what general type of weapon is loaded (either "A-A" or "A-G" for air-to-air or air-to-ground respectively), then the number and type of that weapon. The number and type of weapon displayed is dependent on what was loaded onto the aircraft before take-off. However, regardless of the weapon choices, the F/A-18 will always have its built-in M61A1 cannon.

The third line in the SCP indicates whether the radar is turned on or not. If the letters "APG-66" are *not* displayed on this line, the radar is either turned to standby or it is inoperable. Pressing [R] will turn the radar back on (if it is not damaged).

To see a list of the weapons currently on board, the *Hornet* pilot can either press Enter or Backspace repeatedly to cycle through the complete armament stores, or press V to view onboard stores.

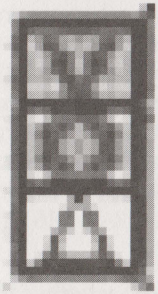
AOA system

The F/A-18's angle of attack (AOA) system is primarily used in conjunction with the instrument landing system (ILS) as an aid in landing the plane. Proper AOA is essential for landing, so these gauges are invaluable when approaching the runway.

The AOA system consists of the AOA indexer and the AOA bracket.

AOA indexer

This gauge, just on the left side of the HUD, indicates how to adjust the plane's attitude to create the proper angle of attack for landing. It consists of three lights that graphically display the AOA:



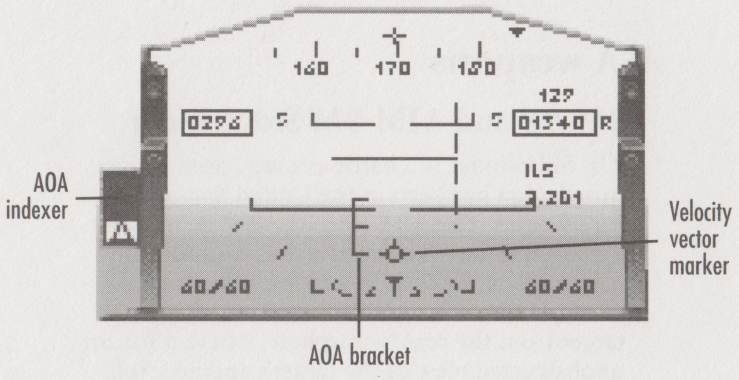
When the top light is lit, the plane's AOA is too high because its airspeed is too low.

When the middle light is lit, the plane's AOA is appropriate for landing.

When the bottom light is lit, the plane's AOA is too low because its airspeed is too high.

AOA bracket

When the HUD is in ILS (instrument landing system) mode, there is an AOA bracket showing appropriate angles of attack for landing. If the Hornet pilot keeps the velocity vector marker in the center of the AOA bracket, the plane's AOA is appropriate for landing.


AOA
indexer
Velocity
vector
marker
AOA bracket

6. Armament

A-A weapons

AIM-9P and AIM-9M Sidewinder

The Sidewinder is a battle-proven, close-range missile that has been in the United States arsenal for 30 years. The AIM-9P is the best of the second-generation Sidewinders, but is outdated compared with the -9M and the -9R (due in service by 1994). The AIM-9P can only acquire its target from the rear hemisphere, where it has an unobstructed view of the target's engines. Still, under good launch conditions, the -9P is a capable weapon.

The AIM-9M is a third-generation model of the Sidewinder. The all-aspect capability allows the seeker to acquire targets from any angle, although it still works better from the rear hemisphere. It outperforms the -9P in all areas, including maneuverability, seeker sensitivity, target tracking, lethality and susceptibility to countermeasures. It also has a low-smoke motor which reduces launch and ingress detection. Of the 1,000 Sidewinders fired in combat since the missile's introduction, 308 destroyed their targets.

AIM-120 AMRAAM

The AMRAAM (Advanced Medium-Range Air-to-Air Missile) was designed to replace the disappointing AIM-7 Sparrow. It is guided by an active pulse-Doppler radar and propelled by a high-speed, reduced smoke rocket. The AMRAAM can acquire its targets beyond visual range (BVR) and be launched at any aspect angle and speed.

M61A1 cannon

The M61 Gatling cannon has been the standard internal aircraft gun of the United States military for 30 years. It is capable in both dogfighting and strafing roles. While current U.S. doctrine stresses the development and use of BVR missiles such as the AMRAAM, the gun is the only weapon effective at very close ranges. In fact, during the Vietnam War, guns accounted for one-third of the air combat kills, despite being installed on only a small percentage of the American fighter contingent.

A-G weapons

AGM-45A Shrike

The AGM-45A Shrike is an anti-radiation missile effective against continuous wave (CW) radar emitters. These include all of our air defense radar systems except the SA-8 Gecko.

AGM-65B and AGM-65D Maverick

The Maverick is a "fire and forget" air-to-ground missile, enabling the pilot to seek other targets or leave the area once the missile is launched. The AGM-65B model uses a TV-imaging seeker with scene magnification to allow the pilot to acquire targets from a greater distance. The Maverick employs a high-explosive shaped-charge warhead effective against tanks, trains and other vehicles.

The AGM-65D model seeker has an imaging infrared seeker which allows target acquisition at night and also helps cut through smoke and dust in the daytime. In addition, the -65D employs a new lower-smoke motor.

AGM-88A HARM

The AGM-88A HARM (High Speed Anti-Radiation Missile) is an upgrade of the Shrike. Towards the end of the Vietnam War, enemy radar operators learned to turn off the radar when they detected a Shrike missile launch. The HARM was developed with a much higher speed and range so it could hit a radar source without warning. It also has a better target acquisition system that is effective against both CW and pulse-Doppler radar. Both the SA-8 Gecko and the Roland SAM systems use pulse-Doppler radar.

BLU-107/B Durandal

The Durandal was designed solely for the purpose of destroying runways. The bomb first penetrates the runway surface and then a delayed explosion buckles a large portion of the runway—damage much more difficult to repair than the crater of a general-purpose bomb. Note that a bomb hit toward the end of a runway might not destroy enough pavement to put the runway completely out of action.

CBU-84 cluster bomb unit

The CBU-84 has fins to spin the unit at high velocity and disperse the released bomblets over a wide area. Each bomblet contains a half-pound forward-firing, shaped charge and a zirconium incendiary ring. This munition is effective against light armor, infantry and other soft targets.

GBU-15 guided bomb unit

The GBU-15 uses a TV or imaging infrared seeker to lock onto its target, then glides to the point of impact using control fins. The GBU should be used for important and hard-to-destroy targets like command bunkers, hardened aircraft shelters

and nuclear weapons plants. In addition, it can be used against targets in civilian areas. The warhead of the GBU-15 is the same as the Mk84.

LAU 5003A rocket launcher

The LAU 5003A rocket launcher fires up to 19 air-to-ground missiles effective against light armor, vehicles and other soft targets.

Mk82, Mk83, Mk84, Mk82 HD (Snakeye)

Simple, cheap and effective, the Mk series of general-purpose bombs usually makes up the bulk tonnage of munitions dropped in any engagement.

The Mk82 is effective against tanks and other ground force targets as well as small buildings.

The Mk83 bomb is effective against medium to small buildings, storage tanks and warehouses.

The Mk84 is the largest bomb in the Hornet's arsenal. It is effective against large buildings, factories, power plants, bridges, hardened aircraft shelters and bunkers.

The Snakeye version of the Mk82 has drag fins which open upon release to rapidly decelerate the bomb. This causes the bombs to hit well behind the plane, allowing a safe egress from a low level drop. This bomb is otherwise the same as the Mk82.

Appendix A: Radio codes

This is a list of some of the messages passed between Coalition pilots and what they mean.

- From AWACS: Negative. Pigeons to home plate. – Usually means the pilot has tried to advance the current waypoint past the last setting (home base).
- From AWACS: Be advised – enemy ECM activity detected. — The AWACS has detected emissions from enemy ECM transmitters. These emissions could interfere with the operation of your radar, preventing you from achieving radar lock. Enemy ECM can also seriously degrade the performance of AMRAAM missiles.
- Kilo Mike Alpha – A message from a wingman if ordered to do something really stupid, like "Break low" when he is flying at 100 ft AGL.
- I've got a spike – I am detecting another plane or ground unit with its radar aimed at you.
- Stranger – An unexpected friendly aircraft is in the area.
- Unable – Unable to comply with your command.
- Copy fence check – I have made sure all my weapons and systems are ready for combat.
- Be advised, I've gone winchester – I am out of A-A/A-G weapons.
- Copy disengage, will resume – Will disengage and resume formation.
- Clean, clear, and naked – Nothing on radar, nothing visual, and nothing on the threat warning indicator.
- Fox one – I am firing an AIM-120 AMRAAM radar-guided missile.
- Fox two – I am firing an AIM-9P Sidewinder missile.

- Fox two mike – I am firing an AIM-9M Sidewinder missile.
- Atoll! Atoll! – A rear-aspect heat-seeking missile has been fired at me.
- Magic! Magic! – An all-aspect heat-seeking missile has been fired at me.
- Apex inbound! – An Apex passive radar homing missile is inbound.
- Guns! Guns! Guns! – I am firing my cannon.
- Flame out – I have been hit and have engine damage or am totally out of fuel.
- Bandit! Bandit! – Enemy aircraft sighted. This message is accompanied by info on its direction.
- Singer high! – A SAM has been launched.
- Request you check joker – I am running out of fuel and want to let you know that you should be aware of your own fuel situation.
- Be advised. Fuel is low – I have only enough fuel to return to base. Any action other than returning to base could be cause for a flameout.
- Copy – Returning to base. — I am carrying out your command to return to base.
- Copy – Closing it up. — I am moving closer in response to your command to close up the formation.
- Copy – Kicking out. — I am moving farther away in response to your command to spread the formation.
- Dumping air-to-ground stores! — I am lightening my aircraft. Usually means the sender has been jumped by an enemy fighter.
- Music on! — I have turned on my ECM pod.

Appendix B: Command summary

Flight Control Keys	
Catapult	Alt C
Tailhook	H
G-limiter override	O
AOA limiter override	Shift O
Fold/unfold wings	Ctrl W
Throttle & Afterburner Keys	
Increase afterburner stage	>
Decrease afterburner stage	<
Landing Keys	
ILS HUD mode	\
Call LSO	Alt H
DDI and HI Keys	
Left DDI toggle	Shift ;
Right DDI toggle	Shift '
Swap DDI displays	Shift K
HI toggle	C
Radar Keys	
ACM mode	F6
Toggle ACM scan area	Shift F6
GM mode	F7
Rivers and roads toggle (GM radar)	Y
Radar scan distance	F8 and Shift F8
Radar azimuth scan	F9
Radar elevation scan	F10
Stores Control Keys	
View stores	V
Inside View Keys	
Padlock view	8 or * on the numeric keypad
Look-up/look-down toggle	K or 5 on the numeric keypad
Miscellaneous Keys	
Radar/barometric altimeter toggle	Ctrl A
Change HUD color	Ctrl H

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