

F-14A/B Tomcat X

Volume 6

Weapons

Version 12 January 2014

RECORD OF REVISIONS

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TACKPACK COMPATIBILITY

The weapon system of the Aerosoft F-14A is meant to be used with the [VRS TacPack](#). However, we tried to make as many features as possible independent of TacPack. Here is a list of features that will work for users without TacPack or with TacPack disabled:

- You can load any allowed weapon configuration from the Payload Manager and weapons will appear under the wings; weapons and stores will affect aircraft weight and symmetry;
- The Aerosoft F-14 has a fully functioning radar that does not need TacPack to operate – you will be able to use the various radar modes and scan patterns, lock targets and get their data on the HUD;
- When the gun is selected, the HUD will display a lead-computing optical gunsight, perfect for dog-fighting practice – if the enemy aircraft is under the gunsight, you can call “Trigger down!” and end the engagement;

However the real power of the Tomcat can be unleashed when TacPack is running:

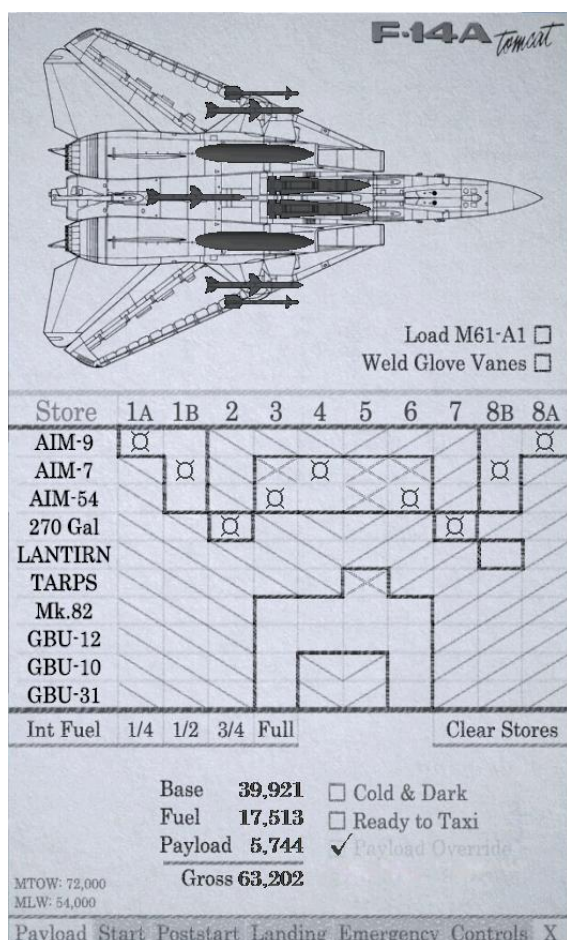
- The missiles you loaded under the wings will now be active missiles, the missile indicators in the cockpit will reflect the current loadout and the weapon legends on the HUD and VDI will report type and number of the currently selected weapon; the gun is loaded with 676 rounds;
- The currently selected missile (Sparrow or Phoenix) can be slaved to the current single target track; the Sidewinder infrared seeker head is active and can lock a target;
- When the radar is in Track While Scan mode it can send target information to the Phoenix missile for beyond visual range shot without alerting the enemy;
- Accurate missile symbology will appear on the HUD and VDI – missile Azimuth Steering Error circle, Rmin and Rmax ranges, and shoot cues;
- Missiles can be released, they will follow realistic flight trajectory and can destroy an enemy aircraft in single player and in multiplayer (when he is also running TacPack);
- The gun can be used to shoot down a bandit when in the guns range;
- The RWR (radar warning receiver) will warn for incoming threats;
- Chaff and flare can be released to distract enemy missiles;
- Iron bombs can be dropped using CCIP delivery mode and will blast ground targets;



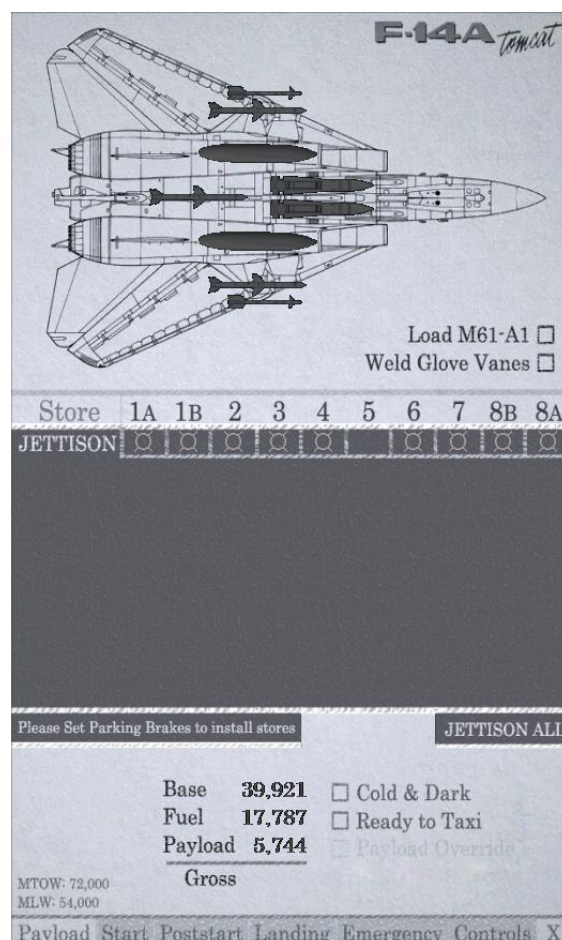
PAYLOAD MANAGER

The Payload Manager (PM) is a 2D panel that is called with Shift+2. It is more than just a payload manager, it also contains pages for checklists and controls. The first page is labelled "Payload" and this is where the stores and fuel is managed.

Weapons loading is enabled with weight on wheels (on the ground) and parking brake set. When in the air or when parking brake is not set, the entire payload grid will be greyed out and stores management will be blocked (see picture on the right). You will be able to see on which stations there is a store loaded on the top line of the grid, next to the label "JETTISON". Clicking on each individual store box will jettison the store when in the air (except for stations 1A and 8A, which carry Sidewinders – they cannot be jettisoned by design). Pressing "JETTISON ALL" will jettison all weapons, except the Sidewinders.



Payload Manager (on the ground)



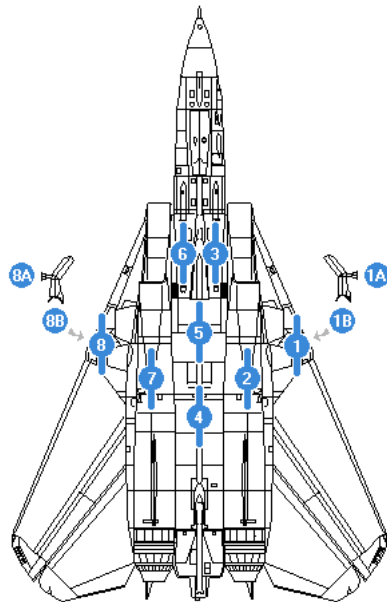
Payload Manager (in the air)

When stores management is enabled, you can click inside a box in the grid and the corresponding weapon will be loaded on the station. Some boxes will be blocked by design, for example you cannot load Sparrow on station 4 and Phoenix on station 5. So in some cases you will first need to unload some weapon to be able to load another to an adjacent station. You can also press "Clear Stores" to clear all stores and start from the beginning. The picture above shows a typical configuration of 2 x AIM-9 + 3 x AIM-7 + 2 x AIM-54.

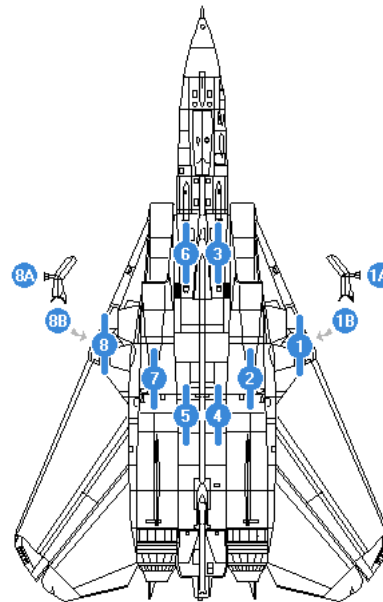
To enable loading in the air, check "Payload Override" checkbox on the Payload page

WEAPON STATIONS

The F-14 has two configurations: Fighter and CAP-Attack (Combat Air Patrol and Attack). The order/numbering of weapons stations differ depending on the configuration:



Fighter



Combat Air Patrol and Attack

Note the positions of stations 4 and 5 on each configuration. In the Fighter configuration, stations 4 and 5 carry AIM-7 Sparrow missiles, and in CAP-Attack configuration they are configured to load AIM-54 Phoenix missiles.

ACM PANEL

The Air combat maneuver (ACM) panel is located on the forward cockpit center console. It contains switches for missile preparation, missile operating mode selection, and for arming the systems. Indicators are provided to inform the pilot of weapon status, when the missile is locked on to the target, and when the missile is ready to be launched.



Air combat maneuver (ACM) panel

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Master Arm Switch. When this switch is set to ON, a master arm signal is sent to the armament panel to enable the master arm logic circuitry.

Weapon Status Indicators. These indicators indicate weapon status. They are only active when TacPack is running. Loading weapons from the Payload Manager without TacPack, will not have any effect on the indicators as the weapons will not be considered live ammunition. The indicators are labeled 1A, 1B, 3, 4, 5, 6, 8B, and 8A, and correspond to the weapon stations on the aircraft. There are three indications possible:

1. White indication—Weapon station is ready and weapon is loaded.
2. Checkerboard indication—Weapon station is loaded, ready, and selected. Only one weapon status indicator is checkerboard at any one time.
3. Black indication—Weapon station has no weapon loaded, or the weapon is not ready.

HOT TRIG Warning Indicator. This warning indicator lamp lights to notify the pilot that missiles are ready for launching, the gun is ready to fire, or the weapons selected are ready for release or firing.

GUN RATE SWITCH. The GUN RATE switch is located on the ACM panel. It is a two-position, push-button, indicator switch that selects HIGH (6,000 rounds per minute) or LOW (4,000 rounds per minute) rate of fire. This switch is only active in the A/G and A/A modes.

SW COOL switch. The Sidewinder cool (SW COOL) switch is a two-position, push-button switch on the ACM panel. This switch is used to generate the AIM-9 missile cool signal to cool the missiles. When in the ACM encounter mode, AIM-9 missile cooling is automatically selected, regardless of the SW COOL switch position.

ACM JETT Switch. This switch is located under the ACM switch guard. When the switch is pressed, the stores on the stations that are selected on the armament panel are jettisoned.

HOOK/GUN PANEL. The HOOK/GUN panel, located on the forward cockpit vertical console, contains the gun rounds counter. This counter provides digital countdown readout of the rounds remaining.

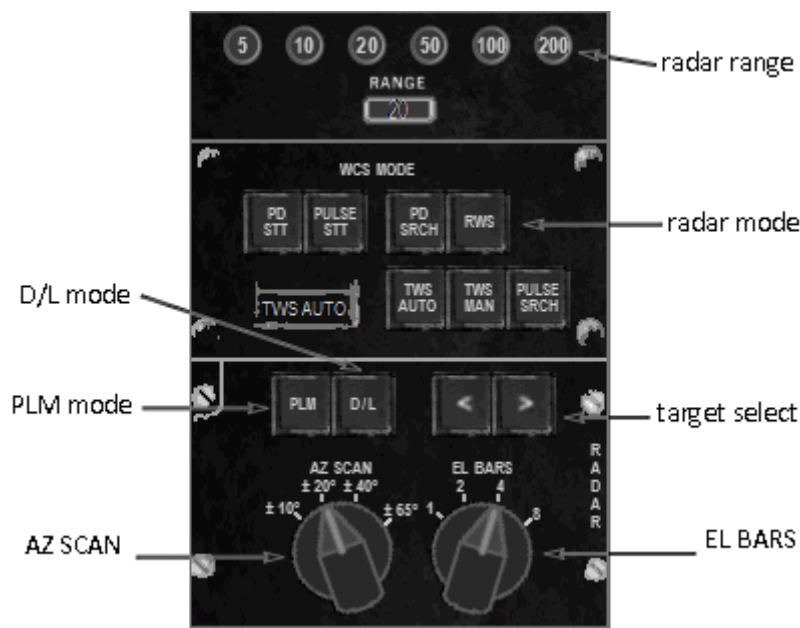
2D CONTROL PANEL

The 2D control panel that is called with Shift+3 duplicates some of the most critical weapon controls in the cockpit. This is where you can select the current weapon. You can still select the weapon from the red weapon selector switch on the virtual flight stick but this requires looking down and is inconvenient.



You can also select the A/G weapon from the 2D control panel (A/G WPN), which duplicates the real selector switch on the Armament Control Panel on the RIO left vertical console. The MASTER ARM switch is also duplicated and you don't need to lift the switch guard in the cockpit, which is done automatically.

The 2D control panel also duplicates the most important radar functions available on the RIO DDD panel and the Sensor Control Panel on the RIO left side panel. From the 2D panel you can select the radar range, one of seven radar modes, and the elevation and azimuth scan pattern.



2D Control Panel (radar controls)

The 2D radar control panel also contains three controls that are not available anywhere else in the cockpit. These are the PLM and D/L mode buttons, and the target select buttons. In the real cockpit the PLM switch is on the lower side of the right throttle, and the target is manually selected by the RIO from the Hand Control Unit. The PLM mode (Pilot Lockon Mode) uses a 2.3° radar beam centered on the aircraft datum line and allows the pilot to instantly get a radar lock on any target that is directly in front of the aircraft. The nearest aircraft within 5 nm and within the boresight circle is automatically locked-up and the radar transitions to STT mode. The D/L (data link) mode connects the Tomcat radar with a Hawkeye and you can see every target around you within 200 n.m. This mode essentially overrides the currently selected scan pattern and gives you a god's eye view of the battlefield. Use this to quickly search the sky and get acquainted with the radar. If you see a target in the D/L mode, but it disappears in the normal modes (e.g. TWS or RWS), try to narrow the azimuth and increase the elevation.

The 2D control panel contains the D/L mode, PLM mode and target select controls.

In TWS mode the AZ SCAN and EL BARS switches will allow only two possible scan patterns - $40^\circ/2$ -bar or a $20^\circ/4$ -bar scan. These patterns require exactly 2 seconds to complete a full scan. In the real aircraft you can select any pattern, but patterns with longer update times than 2 seconds will lead to inaccurate target information or lost targets. So in reality the RIO will only select the above two patterns.

ELECTRONIC COUNTERMEASURE SYSTEM

The Electronics Counter Measure system consists of the ECM lights on the pilot windshield, the Azimuth Display Unit (ADU) in the pilot cockpit (F-14B version) and the AN/ALE-39 Counter Measure Dispenser System (CMDS). Threats are also displayed on the HSD and ECMD displays when ECM mode is selected.

The green steady light on the ECM lights panel is the SAM light and it comes on when a surface-to-air radar is tracking the aircraft. It should be the first to light up. The red light is the CW (continuous wave) light - it will begin to flash as soon as a <missile in flight> radar signature is detected.

The Azimuth Display Unit in the F-14B cockpit shows the threats around the aircraft - SAM activity, radar-controlled antiaircraft gun emplacements or any enemy aircraft. The display uses the same information that feeds the ECM lights. Threats located further out from the center of the display present a greater danger than threats located closer to the center. In a similar manner, the ECM circles on the HSD and ECMD (in ECM mode) provide reference to gauge received ECM source signal strength - the stronger the signal, the further out the threat is on the display.

The AN/ALE-39 CMDS is capable carrying up to 60 chaff, flare and/or radar jammer expendables. By default the Tomcat CMDS will carry 40 flares and 20 chaff expendables. They will start to be released automatically when the red ECM light comes on, at a rate of about 6 per second. The chaff and flare can also be manually released at any time from the SALVO FLARE switch on the panel located on the RIO right side console. The panel shows the current amount of decoys. The dispenser system is reloaded automatically any time a weapon is loaded onto the aircraft.



AN/ALE-39 Counter Measure Dispenser System



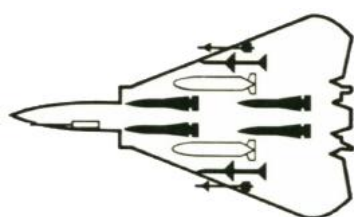
ECM Lights

AIR-TO-AIR TUTORIAL

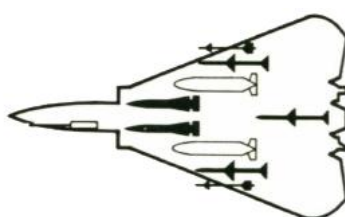
In this section we will go through the full sequence of loading some weapons, spawning a target, acquiring the target on the radar, selecting a weapon, locking the target and launching the weapon. This should give a practical overview of how to use the systems described in the previous sections and volumes of the Manual. Make sure you have TacPack enabled as you will need live ammunition.

PAYLOAD SETUP

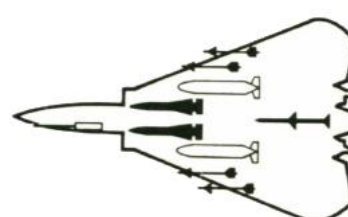
1. On the ground, set your parking brake.
2. Open up the Payload Manager (Shift+2) and go to the Payload page.
3. Select at least one of each missile – Sidewinder, Sparrow and Phoenix. Here are the choices you have if you want to have such configuration:



4 PHOENIX
2 SPARROW
2 SIDEWINDER



2 PHOENIX
3 SPARROW
2 SIDEWINDER



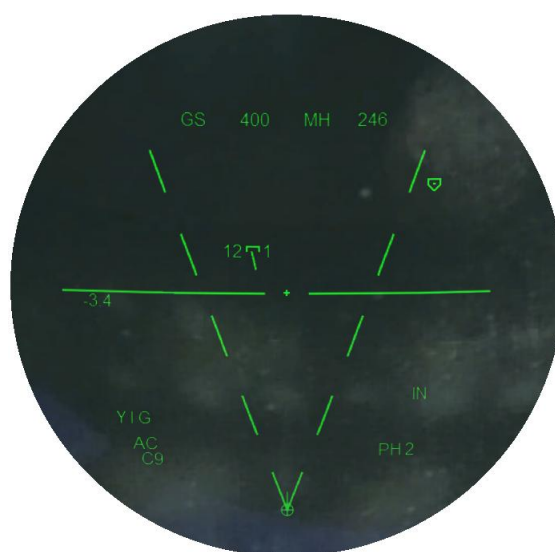
2 PHOENIX
1 SPARROW
4 SIDEWINDER

4. We'd like to have just 2 Phoenixes, as it is a very heavy missile and is generally used for very long range fights. We also prefer to have 3 Sparrows to be able to engage the enemy at longer ranges, and this leaves us with 2 Sidewinders, just enough to finish the bandits at close range. Of course, you are free to choose any other configuration, for example 4 Sparrows and 4 Sidewinders.
5. We can also add 267 gallon external tanks on stations 2 and 7 to increase our combat range.

SEARCH FOR A TARGET

Let's climb to 20,000 feet and find a target to shoot down. You can search for regular AI traffic, but to have more control, we will spawn a TacPack drone:

1. To spawn a drone, go to the FSX in-flight menu and select Add-ons -> VRS AI -> Drone, with the following options:
 - Drone Aircraft: BQM-74
 - Range: 20 nm
 - Relative Bearing: Ahead
 - Heading: Toward
 - Altitude: Ownship Altitude
2. If you go to the RIO cockpit (**press 'A' to change the cockpit view**), you should notice almost immediately the target icon of the incoming aircraft (the drone). This happens because by default the radar is switched on, it is working in TWS mode (20°/4-bar scan) and the range is 20 nm. Because we chose the drone to be at our own altitude, straight ahead, it appears right in the center of the scan volume within the radar's range.



TWS mode, single target

- It will be much harder to find a target that is off-axis – you may need to do a couple of turns in TWS mode with the radar in 20°/4-bar scan, or even in RWS, which will allow a tighter scan area but more elevation, for example 10°/8-bar scan. This is the maximum elevation of the antenna and will allow you to find targets much higher or lower than your current altitude. As a final measure, you can press the D/L mode button (AWACS data link simulation) on the 2D control panel, open up the antenna azimuth to the maximum of 65° (AZ SCAN switch) and if there is an aircraft around you will see it on the radar screen.

SHOOTING A TARGET

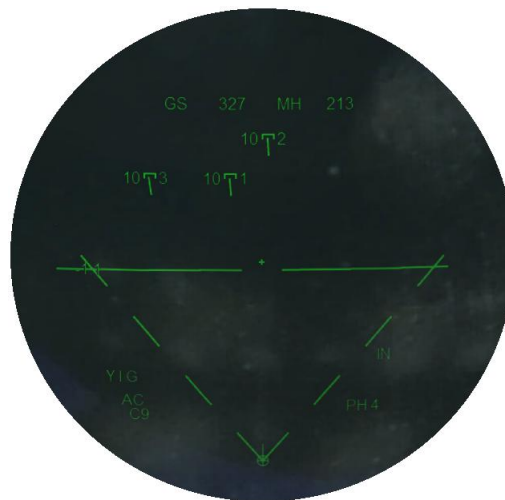
At this point you can just make use of the radar and try and approach nearby aircraft. But we have a drone flying directly towards us and we don't know its intentions. So we will go to A/A mode and shoot it down. Open up the 2D Control Panel (Shift+3) and switch to A/A mode. You will notice the virtual cockpit flight stick is now hidden to allow a clear visibility to the HSD. By default the HSD works as a TID repeater, so you will be able to operate the radar and watch the targets on the HSD without jumping to the RIO cockpit. You should be able to see the drone ahead of you.

AIM-54 PHOENIX (TWS MODE)

- You need to select a weapon to shoot down the drone. The reason we didn't lock the drone on the radar (we didn't go to Single Target Track mode), is because we can launch a Phoenix in TWS mode without a radar lock. The range is good for the Phoenix and we can select it from the weapon selector on the 2D control panel (click next to the 'PH' label).
- When Phoenix is selected the number '1' will appear on the right side of the target icon – this is the Phoenix priority number. If there was a second target, it would have priority '2', and so on, up to the number of AIM-54s on board (maximum six).
- At this point the target icon should begin to blink (actually just the target aspect line will blink). This is your indication that the Phoenix has a good firing solution – the target is within Rmax of the weapon and the seeker head is slaved to the radar.
- Put the MASTER ARM to ON (either from the 2D control panel or from the ACM panel on the pilot center console). The cross over the weapon on the HUD, VDI and TID will be removed, and you will get a **HOT TRIG** indication.

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5. You can now press the fire button on your joystick (the button is mapped in the TacPack Configuration Manager, General Preferences -> Trigger Mapping), or you can make use of the big red **LAUNCH button** on the RIO Armament Control Panel (left vertical console). You should immediately see the number of Phoenixes go down by one on your TID display.
6. In a couple of seconds the Phoenix will hit the drone. To watch the explosion right-click on your screen, select Air Traffic -> Drone. You will see the AIM-54 in this menu as well.
7. If you have more than one target, the next target in the priority list will begin to flash as soon as you release the first Phoenix (and the target is within range) and you can fire another Phoenix within seconds of the launch. In the picture below you have 3 targets and enough AIM-54s to take them all out with a quick succession of releases.



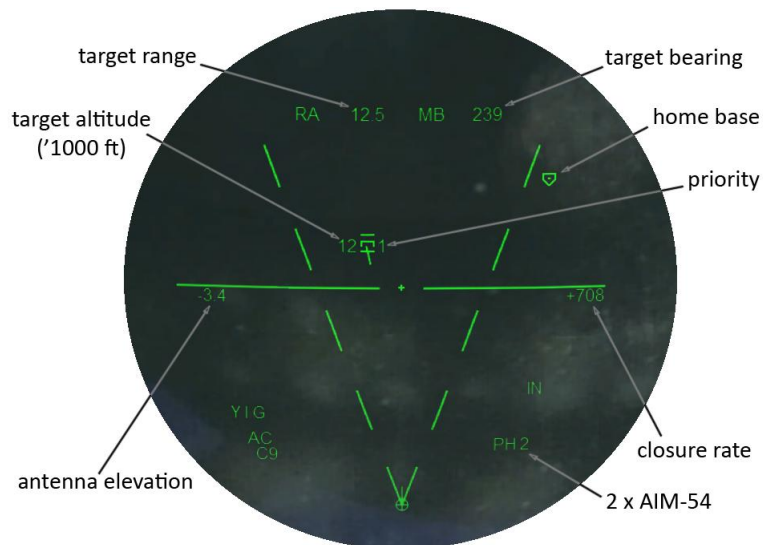
TWS mode, multiple targets

AIM-7 SPARROW (STT MODE)

1. The AIM-7 is a semi-active radar-guided missile, so it needs continuous illumination of the target by ownship radar for proper operation. The target must be maintained in full track throughout the entire time of flight to intercept. The maximum range is about 30 nm.
2. The preferred Radar launch mode is Single Target Track (STT). This provides the feedback on the tracking capability of the radar pre-launch. There are two ways to get into STT – to manually select a target, or to go through the PLM auto acquisition mode, which transitions to STT. We will describe the second method in the Sidewinder section, and here we will use the first method.
3. Spawn a drone 20 nm ahead of you, set your radar range to 20 or 50 nm, TWS mode, and wait for the target to appear on the radar screen. Open up the 2D Control panel (Shift+3) and use the left and right arrow buttons on the panel to select the target. Selecting a target makes it a priority target (or target of interest), but does not transition the radar to STT mode, the radar antenna continues to swipe the scan volume and update the data of the other targets. The selected target is simply a direction to the computer, rather than the antenna.
4. A special cursor will appear in the form of two horizontal lines above and below the target icon. If you have more than one target the cursor will cycle over each target. If you want to hide the cursor, just press the left/right arrow until it disappears. Because you are in TWS mode, the radar will be able to give you some additional information about the selected target. On the upper left corner of the TID (or the HSD repeater) you get the target range in nm, and on the upper right corner the target bearing. On the middle right corner you also get the target closure rate in knots (positive means the range is closing, and negative – the range is increasing). In the picture below the selected target has a

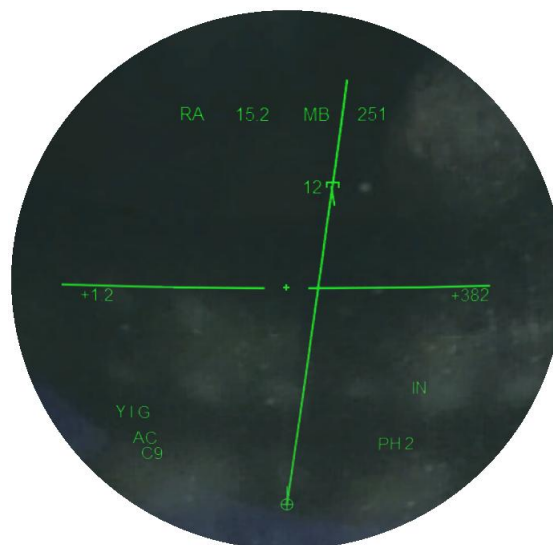
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bearing 239°, range 12.5 nm, closure rate 708 knots, and altitude about 12,000 ft. The currently selected weapon is Phoenix.



RIO: "Bogey... bearing 239, range 12 miles, altitude 12,000 ft, 700 knots closure..."

- Once you have decided which target you want to attack, just press "PD STT" on the 2D control panel (or the DDD panel in the RIO cockpit). This will immediately focus and lock the antenna on the selected target and it will become the single target track. All other tracks will be dropped!



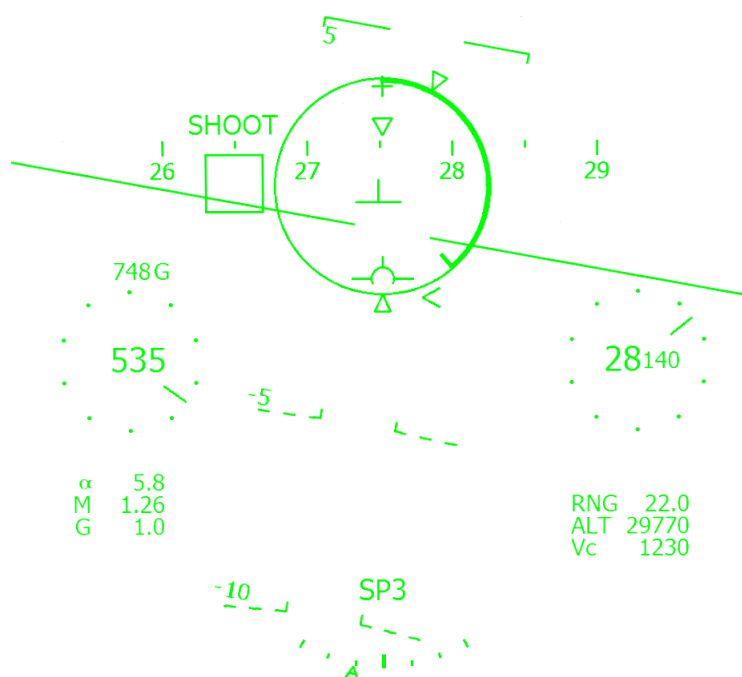
STT Mode

- The symbology on the HUD will also change. We already have a STT, so let's switch to Sparrow and check the HUD. Cuing consists of target designator box (TD box), Azimuth Steering Error (ASE) circle and Steering Tee, SHOOT cue, target range, altitude and closing velocity.

7. The **Allowable Steering Error (ASE)** circle and **steering tee** are used to provide lead angle steering for all Air-to-Air missiles against the target. The ASE circle on the HUD is constant in diameter. Changes to the ASE, which occur during the course of an intercept, are handled by changing the rate at which the Steering tee moves. The steering tee represents the appropriate steering solution for the missile prior to launch. The aircraft should be maneuvered to place the steering tee within the ASE circle. This provides lead pursuit for the aircraft such that the missile is pointing along a collision course to the target, thereby aiding the missile in kinematic energy conservation.

The small triangle marks on the outside edge of the ASE circle indicate **Rmax** and **Rmin**. The range bar on the inside of the circle rotates to indicate the target range. When the range bar is between the Rmin and Rmax, this means that the target is within the effective range of the weapon.

Note on the image below, although the target is outside the ASE circle, there is a good firing solution (as indicated by the SHOOT cue). This is because the target is moving from left to right (we are seeing its starboard side), and positioning the steering tee in the center of the ASE circle puts our nose in front of the target (on a collision course). This will allow the missile to fly a straight line, rather than maneuver right if we had put the target in the center.



HUD in A/A mode, radar in STT, AIM-7 selected

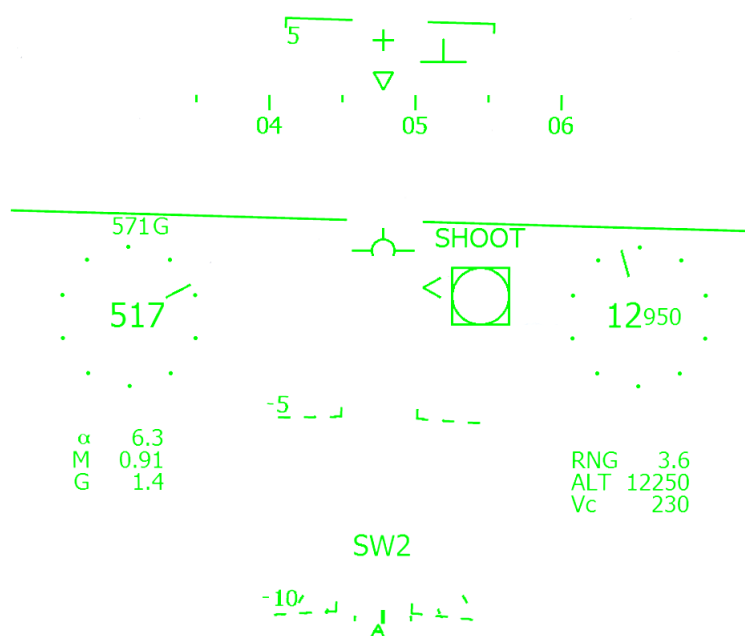
8. The **SHOOT cue** is displayed above the TD box on the HUD. For a non-jamming situation the following criteria must be met for displaying a steady SHOOT cue:
- ✓ A/A flight mode selected
 - ✓ Missile onboard and selected
 - ✓ Radar in STT on the target
 - ✓ Target range less than Rmax
 - ✓ Steering tee within the ASE circle

You may also get an **IN LAR cue** prior to the SHOOT cue, which indicates that the target is within the Launch Acceptability Region (LAR) but the missile has not locked the target yet.

9. Once you get the SHOOT cue, all you have to do is put the MASTER ARM to ON and **fire the weapon**.

AIM-9 SIDEWINDER (BORESIGHT)

1. The AIM-9 Sidewinder is a short-range air-to-air missile that uses infrared homing for guidance. You do not need the radar to be working to launch a Sidewinder. The maximum range is about 10 nm.
2. When you select a Sidewinder, you will hear the familiar growl sound and a small 1.5° circle will appear fixed at the gun cross. The circle represents the AIM-9 seeker head. Positioning the visual target within the circle will allow the AIM-9 to lock on if the target is within seeker range. When the target is locked, the **SEAM LOCK** advisory on the ACM panel will light up and the AIM-9 tone will increase in pitch. That's all you need to launch the missile.
3. It is very convenient to use the PLM radar mode to ensure the target is automatically acquired by the radar when it is in your field of view and within 5 nm. The radar will transition to STT and you will be able to see the target designator box and closing velocity on your HUD. Even though the AIM-9 seeker head is boresighted, and not slaved to the radar, the STT target information can be very helpful in the close ranges that Sidewinder is used.



HUD in A/A mode, radar in STT, AIM-9 lock

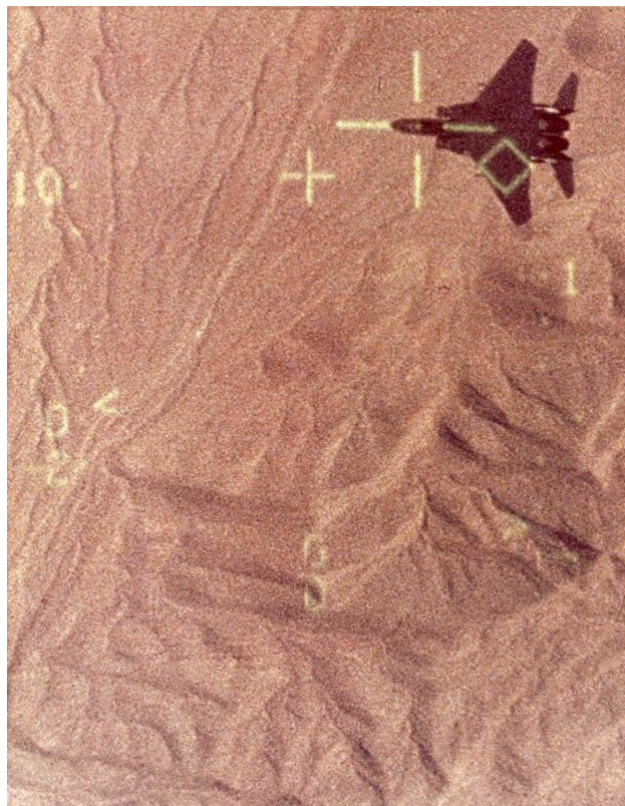
GUNS

The F-14 is equipped with 20mm M61 Vulcan (M61A1) Gatling-style cannon. The gun system is mounted in the forward fuselage on the left side of the aircraft and accommodates a maximum of 676 rounds of 20-mm ammunition. Its effective range is about 3,000 ft.

1. To use the gun, simply go to A/A mode and check if GUN is selected (either on the 2D control panel or directly on the armament legend on the HUD). If the enemy is close, you can put the MASTER ARM to ON at this point and you will get a HOT TRIG indication. The gun cross on the HUD will be removed.
2. The gun fire can be most effective if you track the bandit on the radar. The radar will feed the gun director target data to calculate the lead angle necessary for a good shoot. This means that the pilot needs only to put the enemy aircraft under the gunsight and press the trigger. To ensure a radar lock, put the radar to PLM mode and it will quickly acquire the target when it passes in front of you.

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3. If you don't achieve a target lock, you can still make a good shot, but you will have to use the gun cross above the aircraft waterline as a reference. The gun cross shows the departure line of the bullets as they initially leave the gun and provides a fixed aiming point. It is positioned above the waterline because the gun has a built-in upward slant. If you are in a tight turn with the enemy, you need to position the gun cross ahead its flight path to allow for the lead angle.
4. The image below is the famous 8" x 10" single frame of the 16 mm gun film showing an F-15 through the F-14A HUD. By the target diamond on the F-15 we can tell the radar is in STT mode tracking the Eagle, gun is selected and the gun pipper is right on the pilot's helmet, relative velocity is close to zero (left scale), range is about 250 ft (right scale represents 1 mile), MASTER ARM is ON (no 'X' over the 'G'), and half detent on trigger depressed (which activates gun camera and opens the gun gass purge doors), with zero rounds remaining. The F-14 pilot was the legendary Joe "Hoser" Satrapa.



No Kill Like a Gun Kill