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Author	Topic: Falcon 4.0 Training Mission Report #05

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posted 09-01-2003 17:32

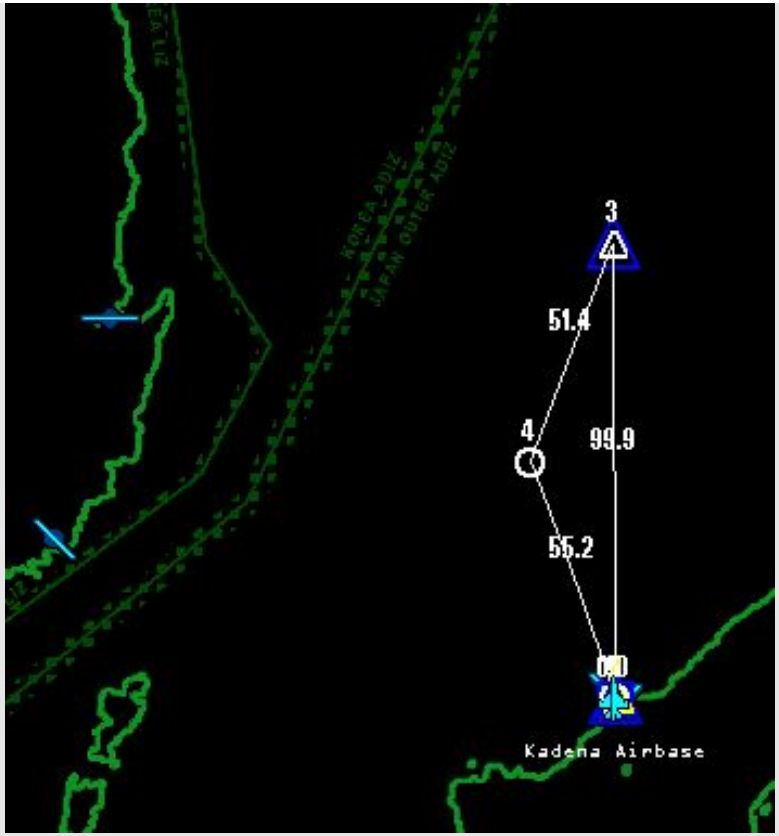
08/31/03
Falcon 4.0/SP3 Training Mission Report #05

Objective:

Basic air-to-air radar employment.
Basic AIM-120 AMRAAM employment.
Basic AIM-9M employment.
Basic padlocking.

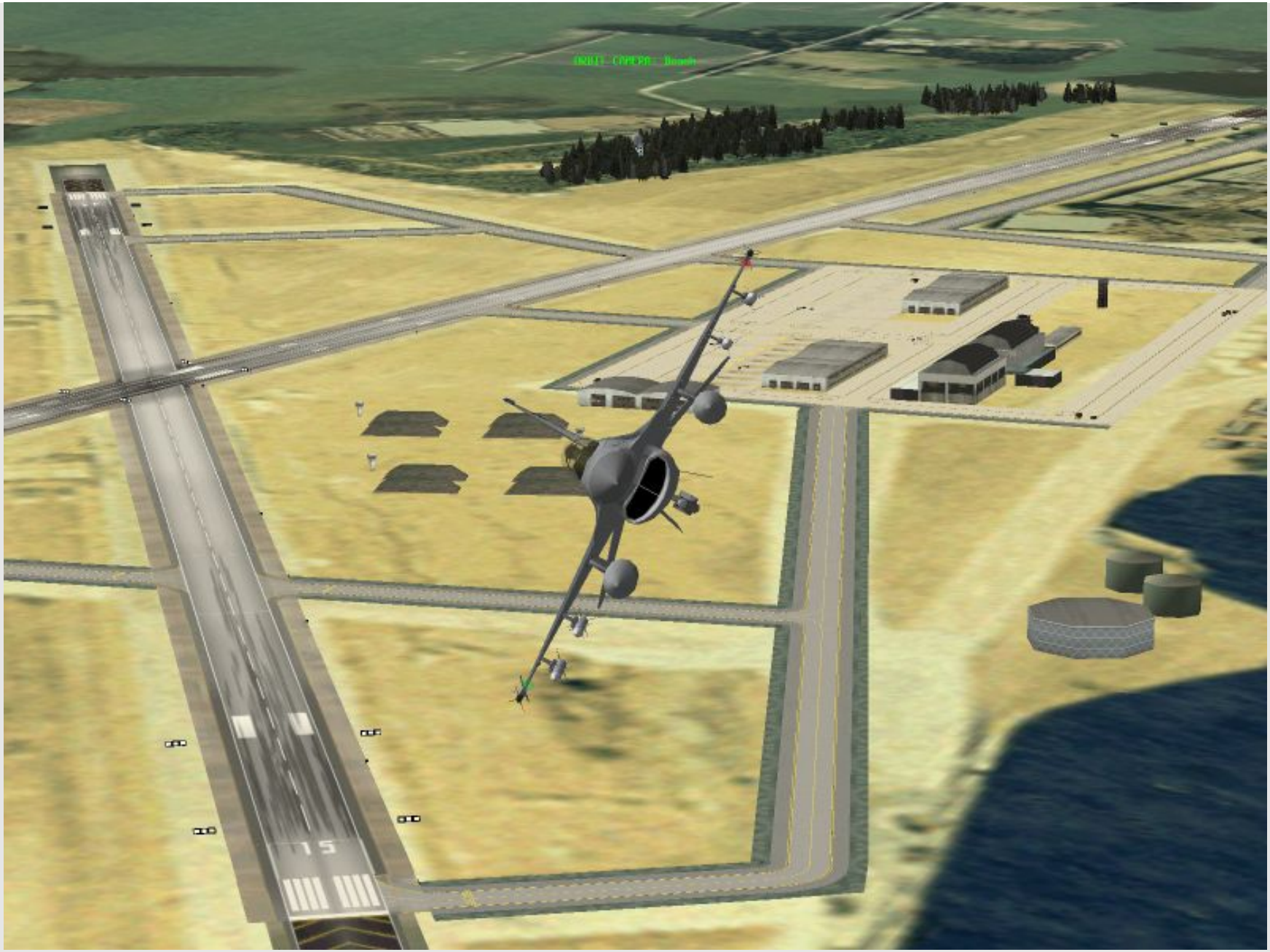
Planning/preflight:

Today we finally get to blow something up! We'll be flying out of Kadena AFB in Japan for today's Shoot Exercise against a pair of known target drones. The targets will be located approximately 80 miles due north of Kadena. We will take-off, climb to 10,000 feet and sweep the exercise area for the targets with our air-to-air radar. After getting clearance from the Range Safety Officer we will launch a single AIM-120B missile at optimum launch range then, assuming the first target is destroyed, we will maneuver for an AIM-9M shot on the remaining drone.



Debrief:

Blasting off out of Kadena we turn north-bound out over the Sea of Japan toward the exercise area:



Checking the new high-resolution knee map provided with Aeyes cockpit:

Firing up the radar in Range While Search (RWS) mode we start looking for the drones ahead of us:

RWS uses a B-scope display (a conical projection that is pulled apart into a square shape) and is the primary Beyond Visual Range (BVR) mode for the F-16. Using the radar controls it is possible to change the range, azimuth, bar scan and tilt of the radar. In this shot we have RWS mode selected. As indicated at the upper left corner between the selection arrows we are in the 80nm range. Just below that is the symbology A6 which is the azimuth setting which will be either 1 (+/-10 degrees), 3 (+/-30 degrees), or as is selected now 6 (+/-60 degrees). The azimuth determines how “wide” of a cone you are scanning in front of your jet. If you narrow the cone, you will also see corresponding “gates” appear on the

radar scope graphically showing your smaller scan volume. If you have the Horizontal Situation Display (HSD) active on the right MFD you will see the scan volume also depicted graphically as a wedge on that display. The next set of symbols, continuing down the left side of the radar, represents the sweep options of the radar representing vertical volume that you are scanning. This can be set to 1, 2 or 4 bar scans. We have 4-bar selected. The last option is the tilt of the entire radar set, which allows you to move the scan volume (the bar scan) up or down relative the horizon to look for targets above or below you. Moving the radar cursor (the brackets) up and down will change the volume and altitudes you are scanning ONLY relative the radar tilt, therefore moving the brackets does not change the actual radar tilt. The numbers next to the brackets indicate the maximum and minimum altitudes you are currently scanning. The little blue sideways looking T on the left side of the radar scale indicates the actual radar tilt, each tick on the left side represents 20 degrees of tilt.

So here we are in RWS, 80 mile range, +/- 60 degree azimuth (120 degrees of scanning), 4-bar search pattern, and a scan altitude of 4,000 to 38,000 feet. The target contact is at approximately 40 miles:

Here we've slewed the radar azimuth over to the left a few degrees (moving the entire search volume, both horizontal and vertical, to the left) and am preparing to designate the contact. The contact beneath the cursor now turns into a triangle with the point extending from the nose being his direction of travel and his altitude is under the data block (11,000 feet):

The 17R and 166 in the upper left indicate that the target aspect angle is 170 degrees right (10 degrees off HIS right nose) and his heading is 166 degrees. The WAIT symbology in the center of the radar is telling you that the NCTR (Non-Cooperative Target Recognition) has not yet classified the aircraft (and apparently will not until you go into Single Target Track (STT)). NCTR is an FM system (Fu*king Magic) that does things like counting engine blade radar returns to classify an aircraft based on known variables. In the upper right of the radar MFD the numbers 471 and 544 are the targets airspeed and closure rate respectively. The mysterious "space invader" looking white symbol directly in the center of the radar is the steerpoint symbol that you have selected for navigation.

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The right side MFD, still displaying the HSD, shows your selected radar scan volume as the blue wedge and the targeted aircraft as a yellow triangle:

As Ian Boys notes on his excellent web-site (http://easyweb.easynet.co.uk/~ianboys/f4rev.htm) looking at the HSD after locking up the target is a good idea since it gives a more graphically correct “picture” from overhead the battle-field. He points out that a target well off the flight path or target area may not be a threat to your mission. Something to keep in mind.

A cheat view reveals our targets for today to be a pair of Su-24 “Fencers”:

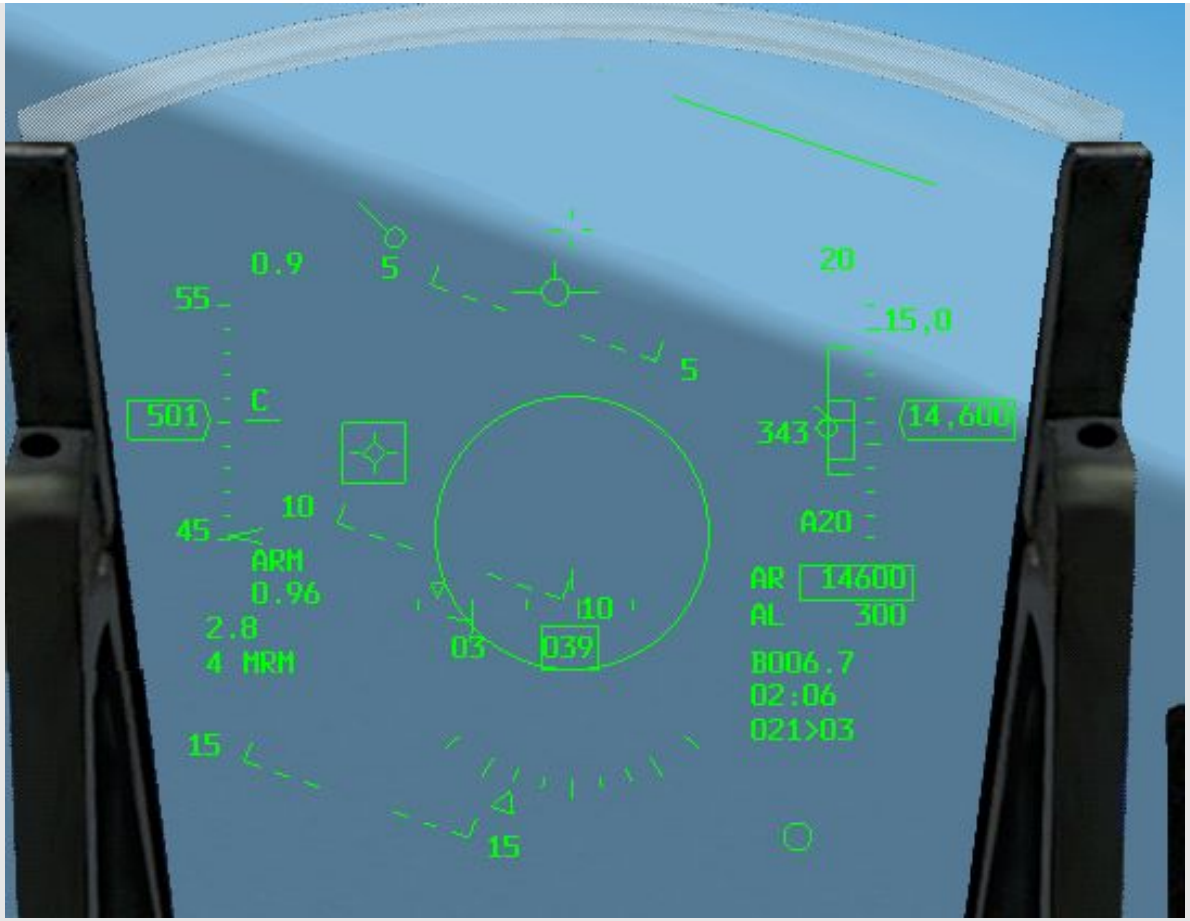
Switching from NAV mode to Air-to-Air mode brings up some extra symbology on the radar MFD. I've selected an AIM-120 AMRAAM missile and you can see the Dynamic Launch Zone (DLZ) scale has appeared on the bottom right of the MFD:

The DLZ is mirrored on your HUD and gives you a good idea of when to launch your weapons. The outer brackets are the maximum and minimum ranges for non-maneuvering targets. Meaning that once the little carat gets below the top bracket, you could theoretically launch and hit the target, provided he did absolutely NO maneuvering. Not a high probability shot. The inner (much smaller) brackets are the max and min ranges for maneuvering targets, also called the “no-escape zone” in which a missile has adequate energy to track a maneuvering (read: evasive) target. Closure rate is also displayed next to the DLZ scale. The round dot inside the no-escape zone is the point at which the AIM-120 will go active.

In the above example, the target I have locked is outside the “no-escape zone”, our closure is 651 knots (he’s almost beaming my radar at this point) and if I launched an AMRAAM right now it would take 16 seconds before it would go active, therefore I have to keep my radar on the target throughout that period to “help” it.

Here the target has continued his left turn, closure rate has dropped a bit but he’s in the “no-escape zone”:

Once the target enters maximum range (non-maneuvering) the target box in the HUD will begin flashing. Once the target enters the top range of the DLZ (no-escape) the entire round aiming reticle in the HUD flashes and it's time to unleash the hounds:



Fox-Three Close!

With a missile on the way the radar contact turns red, indicating the aircraft has been targeted and fired upon:

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The Su-24 goes evasive dropping chaff and flares:

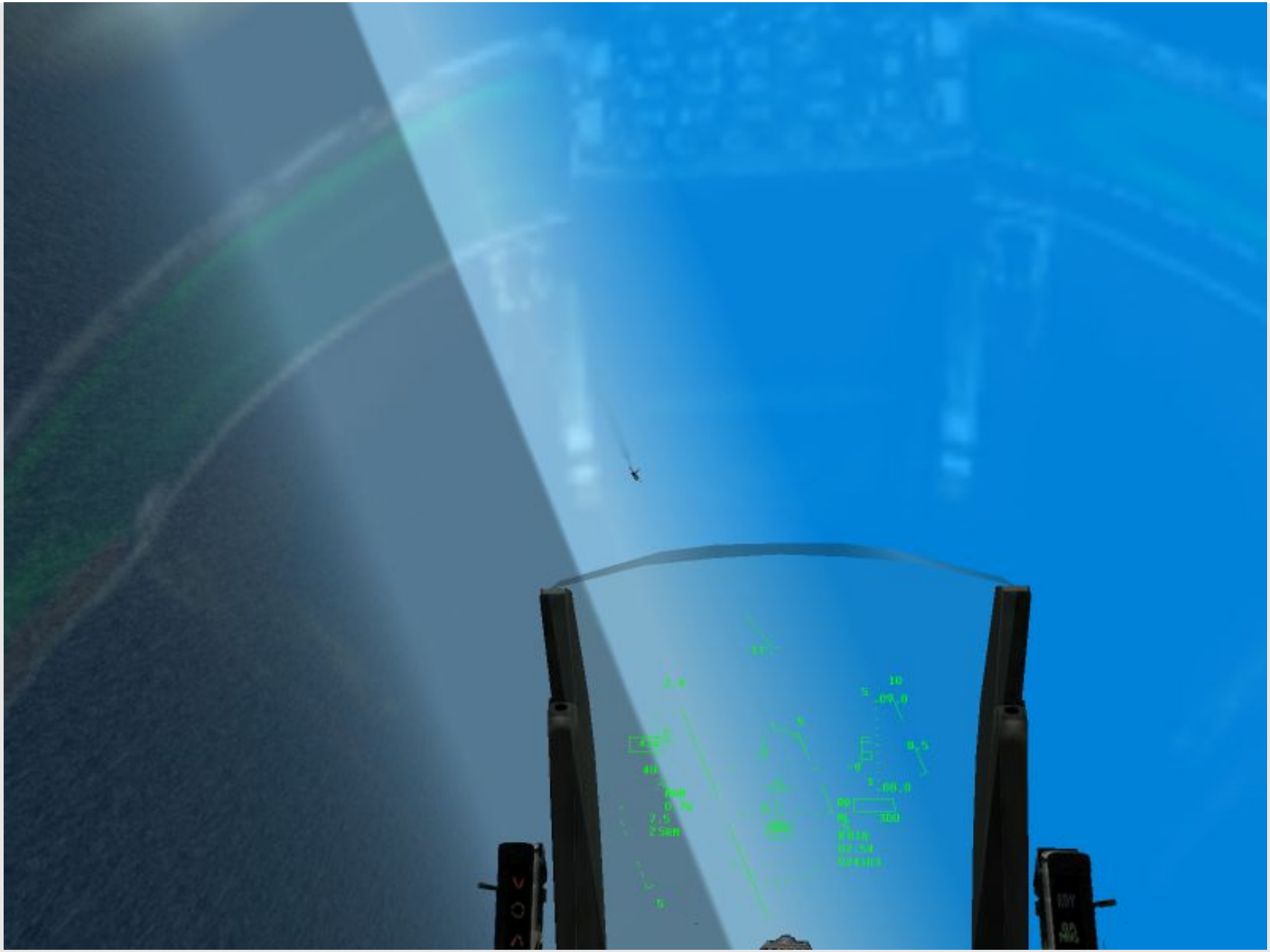

OBJ1: CAMERA: AIM-120B

Splash one Fencer!

Extending out beyond the second Su-24 to get a bit of distance (for practice) I turn back toward him and start scanning for him with my radar:

He's locked up at 5 miles and I close for a rear-aspect AIM-9M shot (check out Aeyes awesome 1600 x 1200 cockpit too!):

Within visual range now pan my view up toward the Fencer and hit the padlock button:



Playing with the padlock view for awhile I maneuver around the target drone getting a feel for the padlock function:

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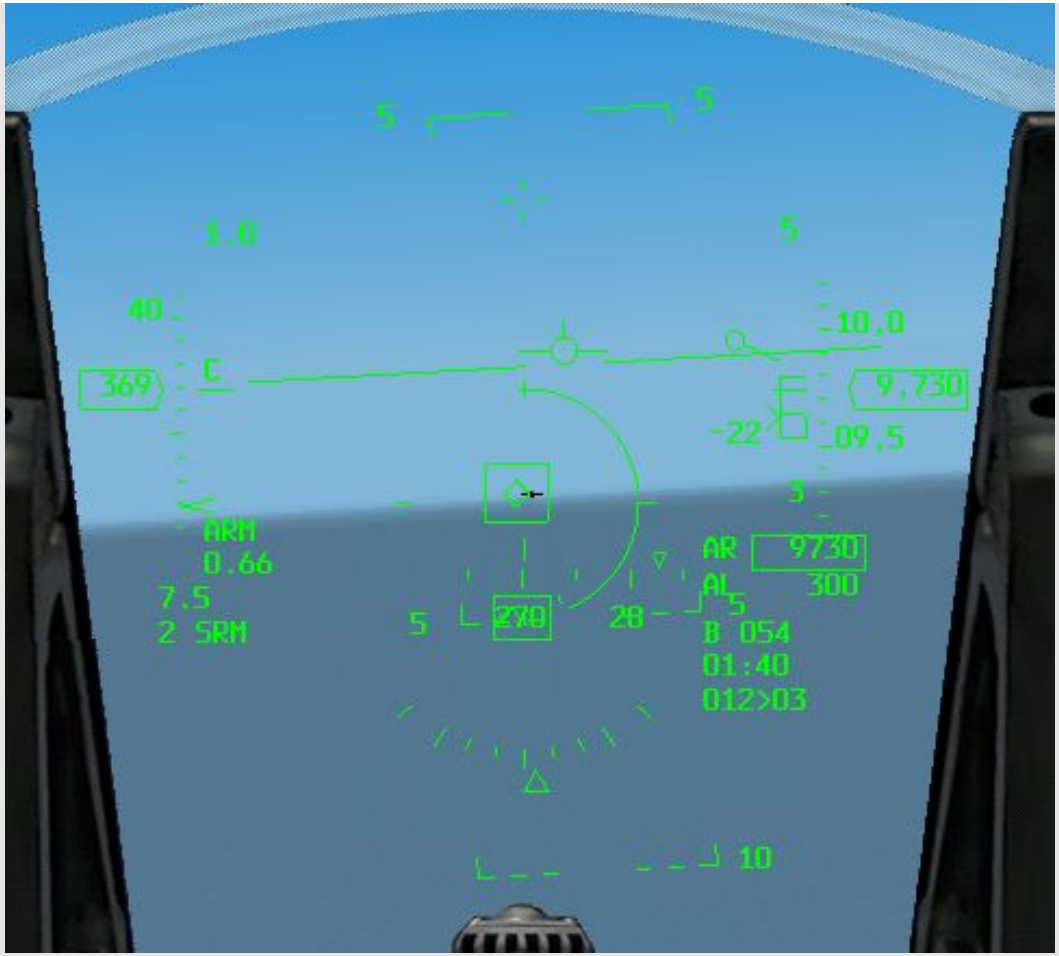
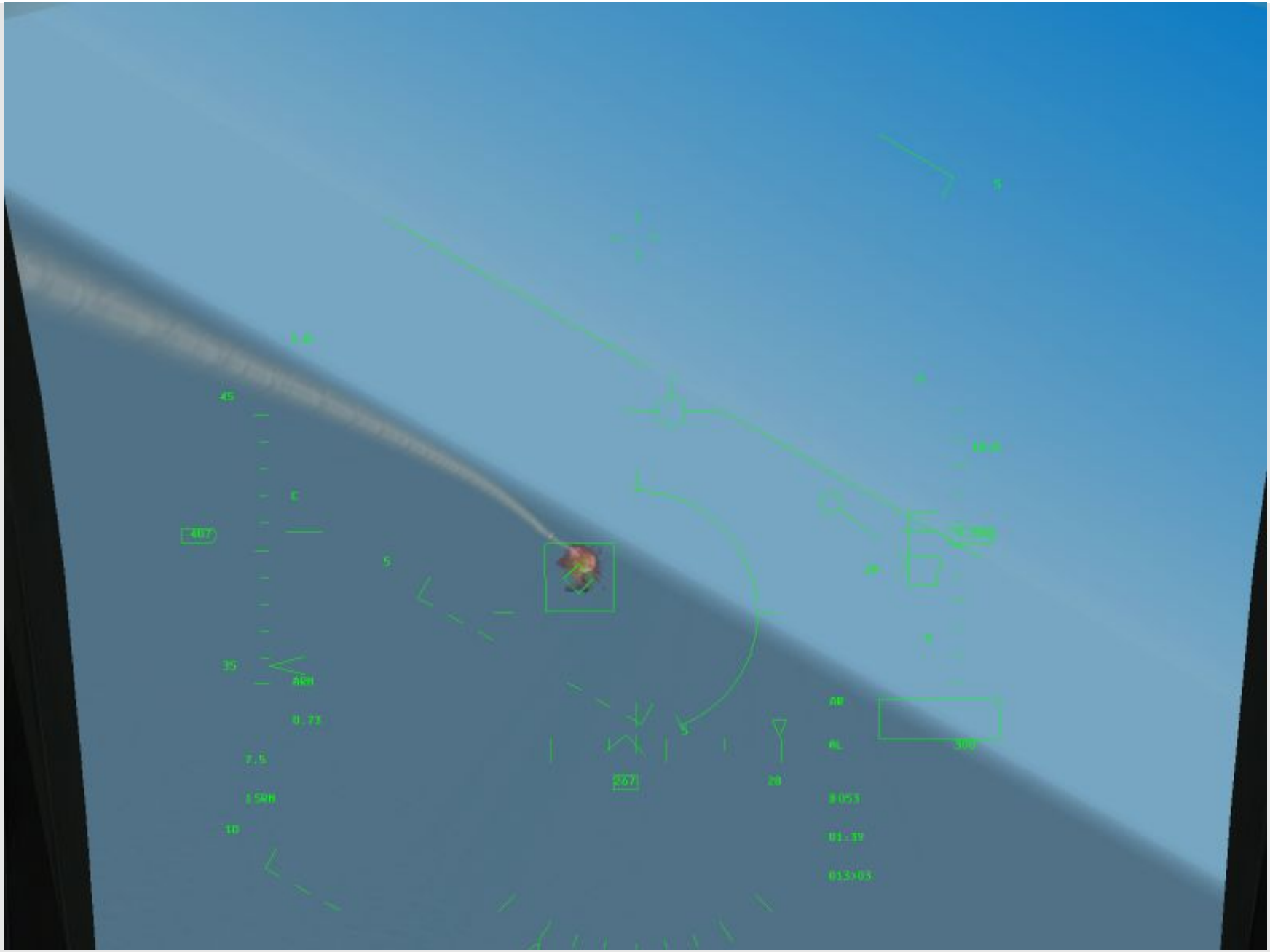
Re-establishing radar lock I select AIM-9M and hear the growl as the seeker head locks on the hot exhaust of the Fencer:

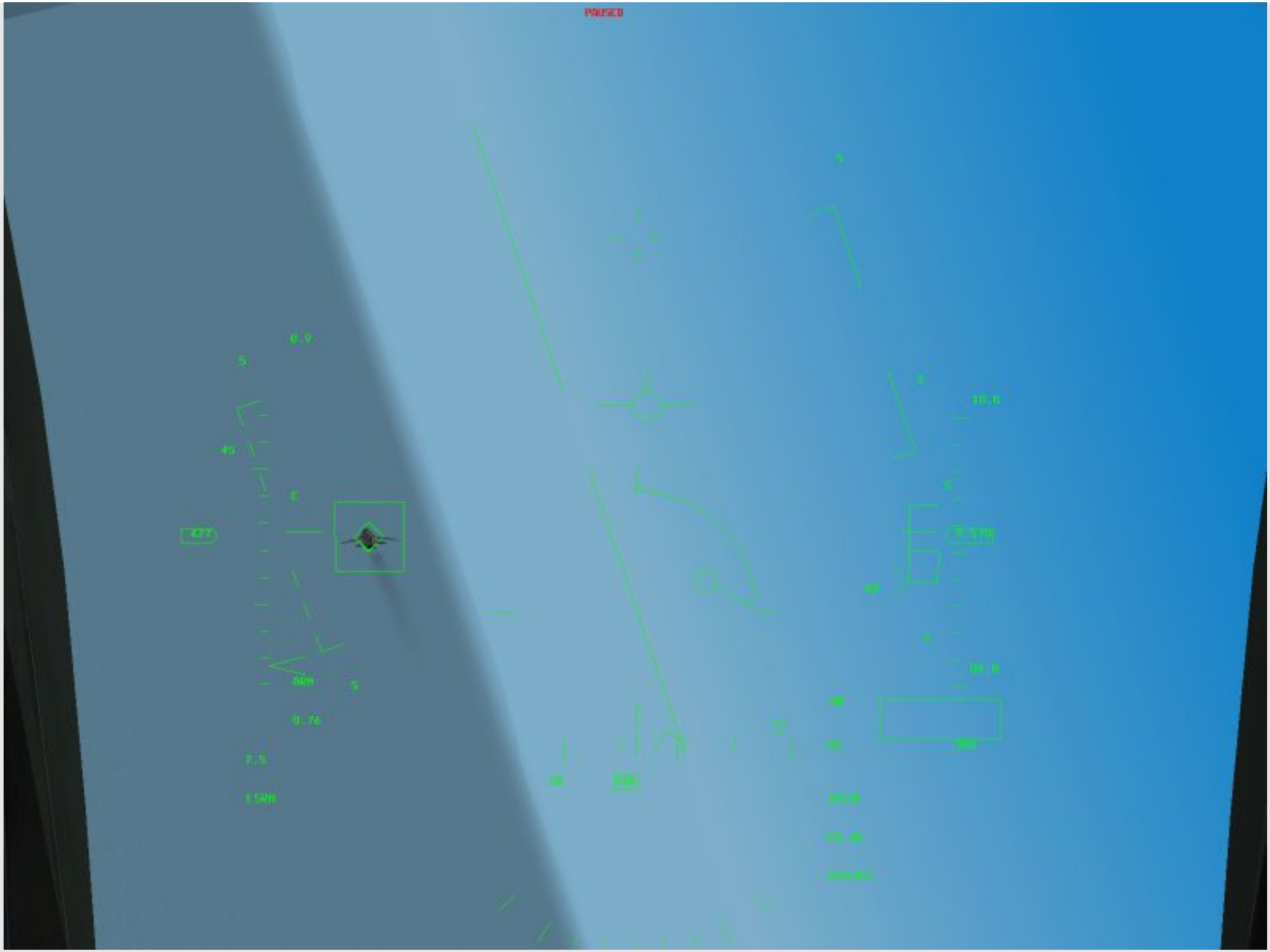

5
5
1.0
5
40
-10.0
369
C
9.730
-22
09.5
5
ARM
0.66
7.5
2 SRM
AR
9730
AL
300
5
270
28
B 054
01:40
012>03
10

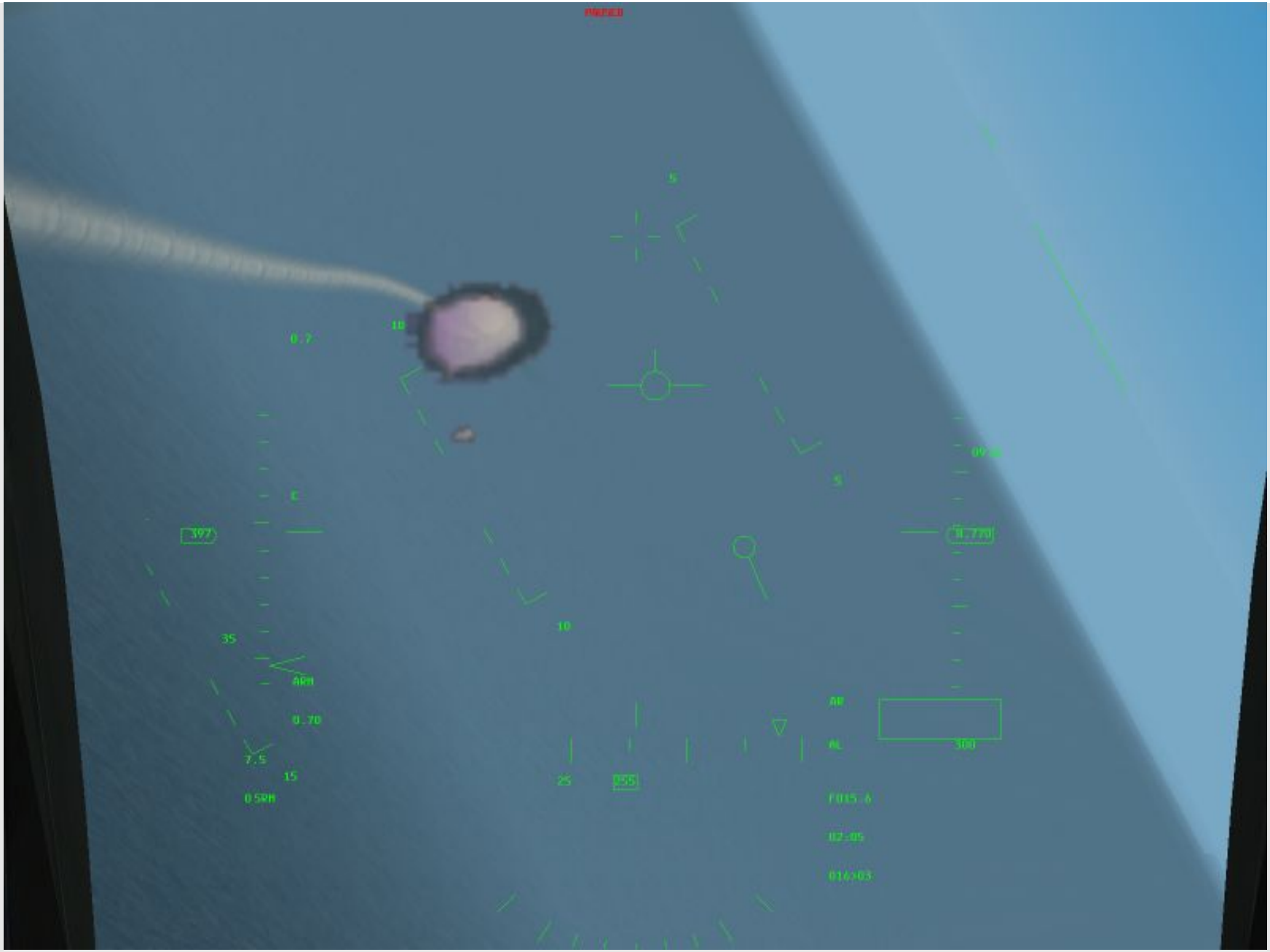
Fox-Two!

The view through the HUD-glass of the shot:


45
35
10
407
5
267
20
01:39

The smaller warhead on the Sidewinder allows the Fencer to limp away so the Range Safety Officer authorizes a second missile expenditure:


PAUSED



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With the range clear I safe my remaining weapons, check my fuel state (9100 lbs) and head back to Kadena:

Back safely I'm thrilled that I finally got to blow something up!

Conclusions:

The radar modes on the F4/SP3 F-16 are very detailed. I probably missed a lot and feel free to chime in correcting any mistakes I've made. The bottom left corner symbology in the radar is still a bit of a mystery to me. Apparently it has something to do with aspect and range to the briefed bulls-eye and also gives you a radar cursor bearing info from the

bulls-eye as well. Since I had no bulls-eye designated in this admittedly crude TE I don't think that symbology was doing anything.

Combat with the F-16 is going to be awesome and it's fun getting down to the business of delivering weapons. There are still many more modes and sub-modes of the air-to-air radar to learn, plus ground modes. So there is much more to be learned.

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Great resources abound on the web helped me with this report.

First the stock Falcon 4.0 manual is an excellent resource for all things about the avionics.

Second, the SP3 manual is awesome.

Ian Boys has a great tutorial on the radar on his site:

http://easyweb.easynet.co.uk/~ianboys/f4rev.htm

This PDF file is an awesome radar tutorial, not specific to SP3, but rather an earlier Falcon 4 build, but it's still very pertinent:

http://ms.16th.org/16th/files/all/OG-APG68.zip

Also like to thank Aeyes for the awesome 1600 x 1200 pit, both 2D ($11.00) and the free 3D Super-pit...they make this sim really look great!

http://www.cockpits.net/index2.html

BeachAV8R

[09-01-2003, 17:45: Message edited by: BeachAV8R]

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