

# **Ramping up the Artificial Intelligence**

## **PART ONE**

### **Introduction**

Immersion is vital in a simulation. It helps propel a player into a world where they can forget that they are in a game. Immersion can be achieved in many ways. Graphics provide the visual cues to help the player feel part of this artificial world. Sound adds another important dimension.

One of the most appreciated features of the Falcon series is the “Artificial Intelligence” -- or AI -- of entities which exist in the Falcon world. AI is all about the way that everything in this Virtual Universe acts and reacts to all aspects of the simulation. It is what helps make the game feel alive. In these development notes, Lead Pursuit’s Sylvain Gagnon assesses the changes to the “air” component.

## Development Notes

Lead Pursuit has pushed the AI envelope with a multitude of improvements. These include bug fixes but also the addition of a much deeper feature set for the AI. This dramatically improves the way that aircraft interact with other AI planes and human players. Some of the most interesting are described here.

### Targeting

The AI now target aircraft and vehicles based upon distance and threat. In an A-A scenario, the AI aircraft will try to determine the threat by aircraft type, and, from that, the type of weapons it might be carrying. Tactics will vary according to distance, rather than at a specific range. The number of available missiles and number of aircraft is also taken into consideration. The AI is a lot less likely to get distracted by other enemy units in the area. "Target of Opportunity" has been restricted to fewer mission types, such as Sweep and BARCAP.

The use of radar on an AI aircraft is also optimized. If they can, they will use *Range While Scan* and *Track While Scan* where the conditions require. If they're launching a Semi-Active Radar Homing missile (SARH), which requires a constant radar lock from the launching aircraft to reach the target, the AI will wait until the last moment before switching to *Single Target Track* (STT), an radar mode sounds an alert in the targeted aircraft's cockpit, warning of impending attack. But they won't switch to STT at the last minute if the AI determines that the target aircraft isn't carrying a Radar Warning Receiver. This latter condition is determined by target type.



## Under Threat

AI aircraft will fire a “warning” shot if it feels threatened at a longer distance to try to throw the bandit into a defensive position. This will happen, for example, if the aircraft is outnumbered or doesn’t have an advantage according to aircraft type. For example, in an F-16 v Mig-21 encounter, the Viper will not fire a warning shot. But if the AI determines that the threat is the equivalent of an F-16 or greater (such as a Su-27) they will shoot first. This feature adds a lot to the simulation and removes one element of predictability. There’s no “magic method” for the AI to determine the type of target it faces, other than using its onboard sensors which are particular to each type of aircraft or by means of GCI or AWACS support. If a target cannot be identified, the AI will use the target’s current speed and altitude to assess its target. Thus an older aircraft type will have a tougher time trying to understand what the threat is compared to the latest fighter with superior systems.



Before firing a missile, the AI will gain altitude to achieve the optimum range for the weapon. It may also ‘loft’ their missiles. The AI will “notch” the target after missile launch to keep the target locked but away at a safer distance. This is important if the AI is launching a SARH missile. The AI might also “drag” (where the AI does a 180 degree turn and heads directly away from the missile) after an ARH missile goes autonomous.



Of course, when threatened, all AI flights will react but they'll do it in different ways depending on their mission type.

Escort missions will monitor threats to themselves, as well as threats to the flight they are escorting, and engage them if necessary. They will keep pressing them but won't go chasing after unthreatening targets, which would leave the flight they are escorting exposed.



Sweep and Intercept type missions will fly aggressively on targets but vary their tactics based on the scenario. For example, one element may try to lure the target while the other attacks from a different angle.

## **Manoeuvres**

So we know there are many manoeuvres the AI can make in defensive and offensive encounters in **Falcon 4.0: Allied Force**. Before, the AI would tend to “beam” the missile that had been launched at them. This in itself is not a bad tactic, but it was done irrespective of distance to the incoming threat. Now, depending on the range the missile was fired upon, they will either “beam” or “drag” the missile. The AI will decide to drag the missile, if it believes that missile will lose enough energy and speed to prevent the kill. So varying the type of response makes the mission much more dynamic.

## **Switching lead**

Even if you’re flying as a wing, your lead might ask you to take his place if his plane gets damaged and yours is in better condition. You’ll then get all the responsibility of the lead. Same thing if you’re already the lead. You can ask your wing (or element lead) to take your lead. Of course, as the original flight lead, you can take lead back anytime you want.

## **AWACS**

The “Vector to threat” request to AWACS will give a reply listing the most threatening aircraft, rather than the nearest aircraft. Therefore, it can return a threat of a Mig29 20 nm away instead of a Mig21 at just 15 nm.

## **Conclusion**

In summary, the air component of the AI has greatly improved the simulation’s immersion factor, and the player – certainly in the highest skill rating – will need a clear strategy and experience to defeat the bandit

**Part Two -- the new AI Ground component, is next week. Be sure to check back**