

Tango_Romeo's SA-2 for CFS2

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Owner's Manual and Mission Builder's Guide



The SA-2 Surface-To-Air Missile (NATO name Guideline, common name SAM2) gained infamy in the skies over the North during the Vietnam War. This is an original model of that missile created in FSDS2.24 for use as an enhancement for period missions in Microsoft Combat Simulator 2.

The model itself contains only 7 parts, 288 vertices and 195 polygons, and has no texture files. She is composed of reflective bare-metal material. These features guarantee high-framerate performance within the sim, while giving a realistic visual appearance. The SA-2 is an AI 'aircraft' flown by the sim itself, and is not player-flyable. It utilizes an original flame effect by Bub, while all others are stock CFS2. The SA-2 is a large missile roughly 38' long overall, and is represented here after booster separation and is roughly 27' in length. I found no detailed drawings to use as backdrops, and just had to 'eyeball' the design, but feel that I was able to capture the shape fairly well.

The missile's great advantage is that the mission author can precisely control performance. Using standard MB Triggers and Events, a wide variety of effects can be created and are limited only by the imagination. While the purpose of this document is not to be a tutorial on CFS2 Mission Builder (Cody Coyote has done that in spades), it will serve as a basic guide for the SA-2's use to those who have a working knowledge of that program.

Installation instructions are included in the surprisingly small download package, and from here on I will assume that has already been accomplished.

Some General Facts

For purposes of historical accuracy, I will mention that an SA-2 site could launch/control up to three missiles at once, but all three had to be directed at the same target. Of course, multiple sites could engage the same formation of enemy aircraft, so the number of missiles in the air is up to you.

The weapon was Radio Command Controlled by ground-based radar and detonated by a proximity fuse. The maximum range was about 19 miles in a straight line, and the SA-2 is stated to have the ability to engage targets at altitudes of 1,500 to 82,000 feet. It could damage targets within a blast radius of from 60 to 160 meters, depending on altitude due to the large size of the warhead. And with speeds exceeding 3,000 MPH could engage Mach 2.5 aircraft effectively.

The SA-2 was not all that successful over Vietnam, with a hit rate of around 2%. The missile was susceptible to electronic spoofing by the sophisticated EW systems of B-52s and by the jamming pods carried by fighter-bombers. Even for pilots without EW equipment, the missile was relatively easy to avoid by forcing it to attempt a very sharp turn in which it would lose control and breakup. This method depended on having a Mark I Eyeball on the missile itself. In short, it was not a 'sky-sweeper' menace.

Mission Builder

MISSION: Always set the SA-2's Mission to 'Nothing', because you want the missile to follow the WPs you set. *If set to 'Intercept', for example, it will perform like a fighter attacking from the stern only in firing runs like a standard AI, and you might wish the attack to come from other quarters. More on this later.*

MAX NUMBER IN A FLIGHT: 8

SPEED: When testing the SA-2 in player flyable mode, she was capable of exceeding speeds of 2,000kts, but would exhaust her fuel supply in around 45 seconds at that speed still reaching the advertised altitudes. Unfortunately, Mission Builder will not allow you to set her speed at more than 1,000kts, without manually editing the MIS file in Notepad. And I have not tested that potential at this point. However, I have found 1,000kts to be a satisfactory speed for missions.

FORMATION: I recommend Line Astern because it limits the spread of the missiles against a formation of aircraft, but experimenting with others is certainly worthwhile. And varying the spread allows you to limit the damage done by the attack. *When AIs are set on collision courses they will maneuver somewhat to avoid one another, causing the missiles to spreadout somewhat. The amount of spread appears to be dependent on the size of the Damage Box in the DP...the bigger the box, the bigger the spread. This is also affected by speed. The faster the aircraft/missiles are moving the less the spread. More on this later as well.*

SKILL/AGGRESSION: I suggest ACE/HIGH.

WAYPOINTS: The SA-2 will follow WPs like any AI, and can be ground-launched from any location that you have entered in your Airbases.dat file. But it is usually easier to have it start from an

airborne WP, or Spawn it at a player WP. If you do elect to have the SA-2 takeoff, it will look fairly real, as the takeoff roll is extremely short and the climbout steep.

Setup the WPs for the SA-2 so that the course of the missiles passes directly through the center of the target formation. You must use 3 WPs. WP1 is the origin of the SA-2, WP2 is the point at which you wish the SA-2 to explode/self destruct and WP3's function is simply to complete the necessary number of WPs. And here is where you get to start making choices. If you wish to inflict maximum damage on the target flight, place WP2 directly in the middle of that formation, If you wish to inflict only nominal damage to the target flight, place WP2 slightly on the other side of the Target flight's position. Since the target flight is moving at high speed, placing these WPs correctly will require some time-distance calculations on your part, or simply some trial and error experimenting. This is the most difficult part of using the SA-2, so get it right and your mission will look great.

Why the concern over the placement of WP2? There are a number of reasons, but the foremost is that if it is placed in the center of the target flight the SA-2s will detonate there creating maximum casualties. If WP2 is slightly on the other side (and I do mean very slightly) the only casualties to the target flight will be because of direct impacts between their damage boxes and those of the SA-2s.

The second reason for all this concern with WP2's position is that should you elect to inflict nominal damage on the target flight, you have to destroy the SA-2s that survive the pass through that flight. Why do we have to destroy the survivors? Well, because that's what SA-2s did. They exploded when they had come in contact with the target or missed the target. Another more important reason is that though you have given the SA-2s a Nothing mission, once they have made contact with an enemy flight, they will go offensive. And once that happens, the sim takes over and they react like normal interceptor fighters. And this means making firing runs from astern in WWII fashion. This is something we do not want to happen. No matter what your mission scenario, any SA-2s reaching WP2 must be detonated.

DETONATING THE SA-2: Detonation of the SA-2s is going to be accomplished using the special DP file that will totally destroy the missile immediately once the slightest damage is sustained. And we are going to Trigger that damage by creating an Engine Fire in all the SA-2s at WP2.

In MB, you will open the Triggers menu and select the SA-2 flight in question as the Aircraft, and create a Flight/Status/WP Reached Trigger for WP2. You should name the Trigger something like 'SA-2 WP2'.

Next, you open the Events menu to create the Event to go with the WP2 Reached Trigger. Name the Event 'SA-2 Self-Destruct'. Select WP2 Reached as the Trigger. Next select Malfunction/Engine Fire for your SA-2 flight. This is the only option under Malfunction, so you can't miss it. Lastly, check the Repeat Box at the bottom of the Event screen and set the interval at 1 second. The repeating function will allow for missiles arriving at WP2 at slightly different times.

Now in your mission, the SA-2s will fly from WP1 to WP2 and detonate. If WP2 is within the target flight, all of the missiles will detonate amidst the targets. If WP2 is placed just the other side of the target flight, then those SA-2s that survive the attack pass will self-destruct at WP2.

A special caution...if you are going to place WP2 on the other side of the target flight, it must be close enough that the surviving SA-2s get to it before they go offensive and the sim takes them over. If they do not reach WP2 before that happens, they will never reach it and self-destruct will not occur.

OTHER TRIGGER/EVENT OPTIONS: There are other ways to Trigger the Engine Fire Malfunction Event in the SA-2. You can use a specific altitude above sea level, not altitude above the ground. You can use a Stores/% Fuel Trigger as well. Just let your imagination run free.

There are also some options you can use in the EVENT itself. The most useful one is to insert a Time Delay for the Event. Say, for example, you've got your WPs positioned nicely, but your missiles are detonating a bit too soon. Instead of having to reposition your WP2, you can add a Time Delay of a few seconds to your Self-Destruct Event to allow the missiles to move a bit closer before detonating.

FORMATION OPTIONS: Earlier I suggested that you use the Line Astern formation for the SA-2s. This is because it minimizes the spread of the formation as it passes through the target formation, particularly a tightly packed bomber formation. However, if your target formation is widely spread, you might want to use a Line Abreast or Shotai to get some separation on the SA-2s as they enter the target formation.

TIPS & TRICKS (The Squeeze Play): Since AI target formations, as well as Player target formations, will normally attempt to evade incoming SA-2s by, at the very least, changing altitude; I have adopted a 'squeeze play' to counter that. AI bomber formations will normally tend to simply go higher to evade missiles from a lower altitude, or lower to avoid missiles approaching at a higher altitude. Fighter/Fighter-Bomber formations may also split into a turning maneuver. These are simply the normal anti-collision responses of the sim. So it is sometimes useful to send a flight of SA-2s in at a slightly lower altitude and another at a slightly higher altitude than that of the target formation. For example, to attack a bomber formation at 15K, I use a head-on SA-2 formation at 15.5K and a stern SA-2 formation at 14.5K timed to arrive simultaneously. To further confuse the sim (and Players for that matter) I will often use a couple of extra WPs for the missiles varying the higher flight up to around 16K, and then bringing it down to 15K. The lower formation could go from 14.5K to 14K and then back to 14.5K. This tactic normally yields better results than a simple constant altitude attack.

ADVANCED ADJUSTMENTS: There are a number of modifications that can be made to the SA-2 for special-purpose missions, though I do not encourage them. Folks are going to tinker, and if they are, they should do it properly.

The SA-2's primary damage box is named Rocket in the DP. It is set at 20x20x20 meters, and is set there for a specific reason. That reason is this represents the best balance of large damage box and minimum spread of the formation on a collision course with the target formation. But if you are going to use a single missile, then you might benefit from using a larger box in the DP.

If you wish to use some %Fuel Triggers for events, you can reduce the fuel supply of the SA-2 in the AIR file. This I discourage strongly unless you have a good working knowledge of AIR files.

I've tried to keep this fairly brief, yet give you the information needed to use the SA-2 effectively in your missions. Any errors contained in the document are solely mine and unintended. Enjoy!

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