

Guardian / Vector

Device:

Eagle Tree Vector \$238 http://www.eagletreesystems.com/index.php?route=product/product&product_id=136

Eagle Tree Micro Vector \$100 http://www.eagletreesystems.com/index.php?route=product/product&product_id=153

Both of these devices have extensive FPV and multirotor features that are far beyond the capabilities of the Guardian, with commensurate pricing, so it may seem odd to make this comparison. However they have flying modes similar to those in the Guardian for use in Line-Of-Sight flying so a direct comparison is reasonable to that extent. They also offer options that will appeal to some LOS¹ flyers. In the context of this comparison, the main difference between the two is that the Vector includes GPS and Power modules that are optional on the Micro. For the functions described here, they are equivalent.



Modes:

Guardian compatible modes:

2D: The Vector has a 2D mode like 2D in the Guardian. Since it also has built-in throttle control and an altimeter, it offers an altitude hold option in 2D that will hold cruise throttle and manage the flight to maintain altitude or keep the plane below a ceiling, like 400'. There do not seem to be options for auto-turn-coordination or CSS. Flying in 2D is very similar to the Guardian and the altitude hold option makes this even easier.



3D: 3DR rate-mode is supported as well as 3DHH attitude hold mode. Flying in 3DHH is significantly different than with a Guardian. Where the Guardian locks and unlocks all axes together, the Vector manages each axis independently. Like the Guardian, stick motion commands a rate of rotation on each axis but it affects that axis only while the other axes continue to resist axial rotation. In practice this has some subtle and some clear differences.

The deadband the Guardian exhibits near center stick is gone, small stick movements produce small rotation on the commanded axis. The Vector does a somewhat better job maintaining the attitude through the execution of a maneuver. During most maneuvers the Guardian unlocks all three axes leaving only rate stabilization active so the maneuver is basically flown manually. The Vector continues stabilization on all axes throughout the maneuver so, for instance, in a roll where only ailerons are commanded the Vector continues to operate the elevator and rudder to help maintain fuse attitude. The test plane was not harrier capable but this should allow a rolling harrier to maintain the hover angle while rolling.

The most obvious difference in practice is during a normal turn. If the turn is flown bank-and-yank style with ailerons and elevator only, the rudder attempts to maintain the original azimuth. This puts the rudder at cross-controls fighting the other commands. To make the turn properly the rudder must be flown through the turn by the pilot. Developing this habit over the long haul will probably make you a better pilot but if you find this annoying you can simply turn the rudder gain to zero, with the corresponding side effect that rudder will no longer help stabilize maneuvers.

Other features:

The Vector has extensive built-in logging capabilities for a wide range of parameters. This can be useful to analyze what went wrong or just to better understand how the plane is behaving. More electrical information is available with the addition of the current sensor module. Since this logging is on-board it's not subject to telemetry loss.

The addition of a GPS opens up some interesting possibilities.

- Loiter mode allows the plane to circle around a fixed point on the ground. The Vector will continue flying the circle autonomously, maintaining altitude and compensating for wind drift while you get a soda and settle in your chair or focus an on-board camera on a ground point of interest, or just get your bearings.
- Return-to-home mode will cause the Vector to fly the plane back to its initial launch point and then circle that point. This can be a life saver if you have flown too far away and lost orientation. Also invaluable if setup as a failsafe in case of signal loss. It can even be set to climb to a prescribed altitude before returning to clear intervening obstacles, although this shouldn't be necessary if you are flying line of sight.
- Pre-programmed waypoints are also possible. It's a kick to turn on waypoint mode and watch the plane fly itself around your designated course.
- After the flight you can connect the Vector to your PC and use the logged GPS data to see the distance traveled and to plot the flight path on Google to see where the plane actually went. EG: Did it really reach the other side of the lake? Did you keep a safe distance from the road? Etc.

Controls:

The Vector has a remote gain channel that functions like the gain knob on the Guardian. Vectors use a mode channel and a submode channel for mode control. Each of the mode channels can be used with a two position, three position, or multi-position switch to select up to five modes per channel. The modes assigned to each switch position are configurable during setup. This allows the pilot to choose, in flight, between many modes. This feature is primarily useful for FPV flyers who may have the need, and the time, to choose between a variety of modes during an extended flight. For line-of-sight sport flying this can be configured to operate like a Guardian, or enhance it a bit with GPS enabled modes. The configuration is quite flexible, even the channel input assignments may be configured.

Setup:

Vectors may be paired with a conventional receiver for installation. At least 7 channels are needed for full functionality plus any auxiliary channels that may be needed like flaps, camera, or a second aileron channel, etc. For a sport flying installation, one mode channel should be enough, so six channels may be used like a Guardian. Vectors also accept PPM or S-Bus inputs which simplify wiring and the Micro Vector accepts Spektrum satellite input.

The primary setup process uses a USB connection to a PC and a setup app as does the Guardian. For some reason they chose to use a mini-USB connector instead of the micro-USB on the Guardian. The app provides extensive configuration options, many of which are only applicable for FPV or multirotor flying and may be ignored for LOS sport flyers.

Setup may also be accomplished or modified at the field using a transmitter stick menu via an "InfoPanel" which sells separately for \$33 or via the on-screen-display of an FPV setup which requires at least a video transmitter, receiver and display.

One awkward point is that setting level or recording trim changes, which is needed at the field from time to time must be done in the menu. Vectors lack the convenient gesture setting available in the Guardian, making the InfoPanel handy.



Observations & Conclusions:

If all you want for sport flying is the basics; 2D, 3DR, and 3DHH modes of the Guardian, the Vector does these things but it's overkill. The Guardian is less expensive, somewhat smaller/lighter, and field setting the level and trims is more convenient.

Some flyers, however, will appreciate the Vector's advanced features, like altitude holding and in-flight data logging. With a GPS a whole new world of features opens up. Loiter, return-to-home, waypoints, and map plotting are a kick to explore and are well suited to a photo oriented cruiser or other ranging style plane.

For aerobatic flight in 3DHH it's largely a personal preference decision. Some will appreciate the Vector's tighter deadband and continuous stabilization on all axes while others may prefer the Guardian's more natural turning behavior.

¹ LOS = Line-Of-Sight, Flying with the plane in the pilot's view being flow by visual reference.