EAN-Landing Aid

PN: EAN-Landing-Aid

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Alerts

The following notifications are used throughout the document to help identify important safety and setup information to the user:

> △ **CAUTION:** Alerts to a potential hazard that may result in personal injury, or an unsafe practice that causes damage to the equipment if not avoided.

ⓘ **IMPORTANT:** Identifies crucial information that is important to setup and configuration procedures.

📄 *Used to emphasize points or reminds the user of something. Supplementary information that aids in the use or understanding of the equipment or subject that is not critical to system use.*

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1 Overview

This document describes how to configure the SightLine Applications landing aid detection capability.

1.1 Associated Documents

EAN-Startup Guide 1500-OEM: Describes steps for connecting, configuring, and testing the 1500-OEM video processing board on the 1500-AB accessory board.

EAN-Startup Guide 3000-OEM: Describes steps for connecting, configuring, and testing the 3000-OEM video processing board on the 3000-IO interface board

EAN-ARM Application Development: Describes how to setup a PC to develop applications that can be run on the ARM processor of the 1500-OEM or the 3000-OEM video processing boards.

Interface Command and Control (IDD): Describes the native communications protocol used by the SightLine Applications product line. The IDD is also available as a local download on the

Panel Plus User Guide: Provides descriptions of all the settings in the Panel Plus application. (Located in the Panel Plus application in the *Help* menu.)

1.2 SightLine Software Requirements

ⓘ **IMPORTANT:** The Panel Plus software version should match the firmware version running on the board.

1.3 Application Bit Requirements

The functions described in this EAN require Application Bits (app bits) purchased from SightLine. App bits reside on the hardware unit and are enabled with a license file provided by SightLine at initial unit purchase or during a license upgrade process. License files use a hardware ID that is applicable to a specific hardware serial number. For questions and upgrade support contact SightLine Sales.

Table 1: Application Bits Requirement Table

| Function	Minimum Software Version	Required Application Bit(s)
Landing	2.23.xx	Precision Landing. 0x2000

2   Setup and Configuration

Before using the landing aid pattern in the field, print the SightLine landing aid pattern and setup a bench configuration to get familiar with the setup and configuration parameters. The landing aid pattern zip file can be downloaded from the SightLine website.

ⓘ **IMPORTANT:** Printing to an 8½ in x 11 in paper will result in a target that matches the default size for the landing aid detection tool. The landing aid pattern can be scaled to fit most landing scenarios. When scaling the landing aid pattern, it is important to maintain the aspect ratio of the pattern and the white space within the red border.

The following steps reference the Panel Plus software.

1. Connect to the board using the Panel Plus application. See the 1500-OEM Startup Guide or the EAN-Startup Guide 3000-OEM for connection instructions.

2. Confirm the firmware version is 2.22 or greater and the landing feature license is enabled. This can be verified on the *Connect* tab of Panel Plus.

3. In *Panel Plus* set the commanded camera to the camera that will be used for landing. In this example for the 3000-OEM, *Cam 2(2)* is used for landing.
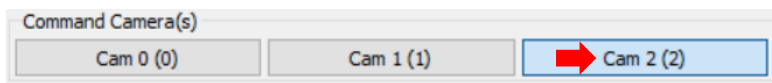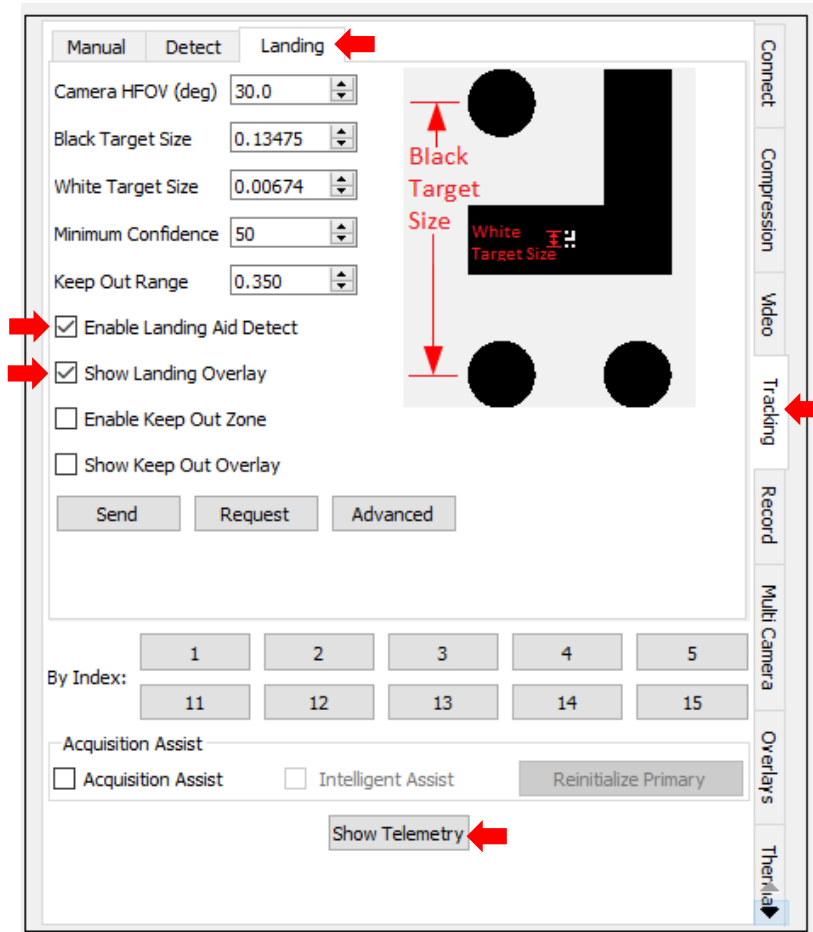

4. From the *Overlays* tab, select *Advanced Overlay* Settings. Enable *Landing* and then select *Send*. Note that the correct commanded camera is shown (*Camera 2*).
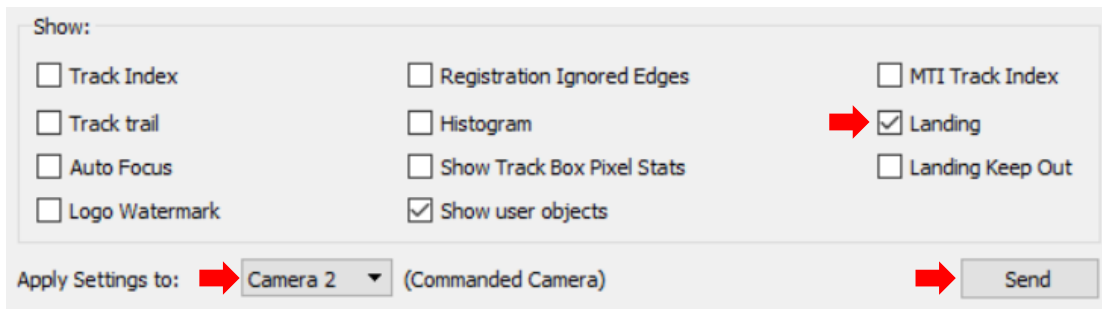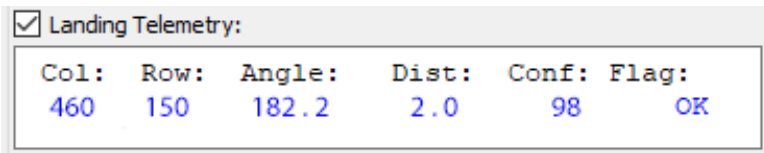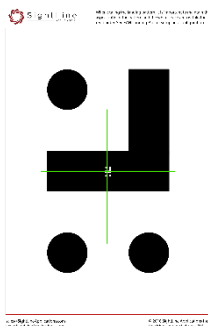
5. From the *Tracking* tab » *Landing* tab, check *Enable Landing Aid Detect* and *Show Landing Overlay*.

6. Click *Show Telemetry*. In the Telemetry window, check the *Landing Telemetry* box to show the coordinates.

7. Verify that the cross is centered on the landing aid pattern and that the coordinates and score show up in the L*anding Telemetry* section.

2.1 Target Size Setup

When setting up the landing pattern in Panel Plus it is important to pick units for the target size that will not overflow the distance value returned in the telemetry. For example, if the target size is specified in meters the maximum distance possible to report is 65536 meters. If the units are specified in cm, the maximum distance is 65536 cm = 655.36 meters.

Any units of measurement can be used in the black and white landing pattern target size fields. Whatever units are used, the result distance will be in those units. For example, if the black target size on the pattern is 0.13475 meters. The distance to target result will be in meters.

Black Target Size: Measure the vertical distance between the centers of the two black dots of the printed landing pattern as shown in Figure 1.

White Target Size: 5% of the Black Target Size height.

📄 *When scaling the landing aid pattern, it is important to maintain the aspect ratio of the pattern and the white space within the red border.*
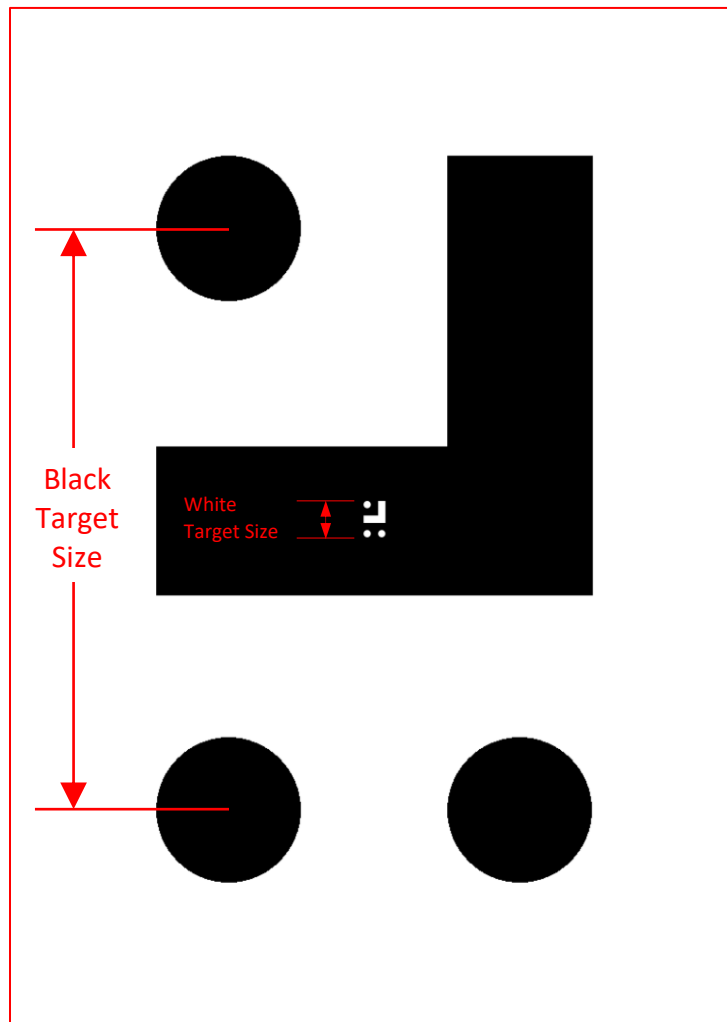

Figure 1: Landing Pattern Target Size

2.2 Camera Horizontal Field of View (HFOV)

The camera HFOV can be set using one of the following methods:

Method A): Calculate the camera's HFOV from known camera and lens parameters.

Method B): Calibrate by measuring the distance between the camera and the target. Adjust the camera HFOV until the distance shown in the Telemetry dialog matches the measured distance between the camera and target.
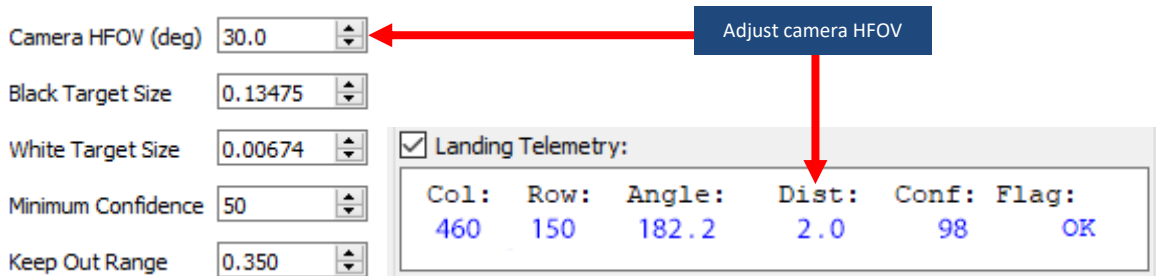

Figure 2: Setting Camera HFOV

2.3 Control Parameters

Four generic control parameters are available that are included with the Landing Position (0x83) telemetry packet. In the ARM Example Application these parameters are used to set the PID gains in the landing controller.

These parameters are 16-bit unsigned integers in the interface, any scaling or conversion is left up to the end user of the Landing Position packet.

The control parameters can be accessed by clicking on the *Advanced* tab In the *Landing* dialog window shown in Figure 3.
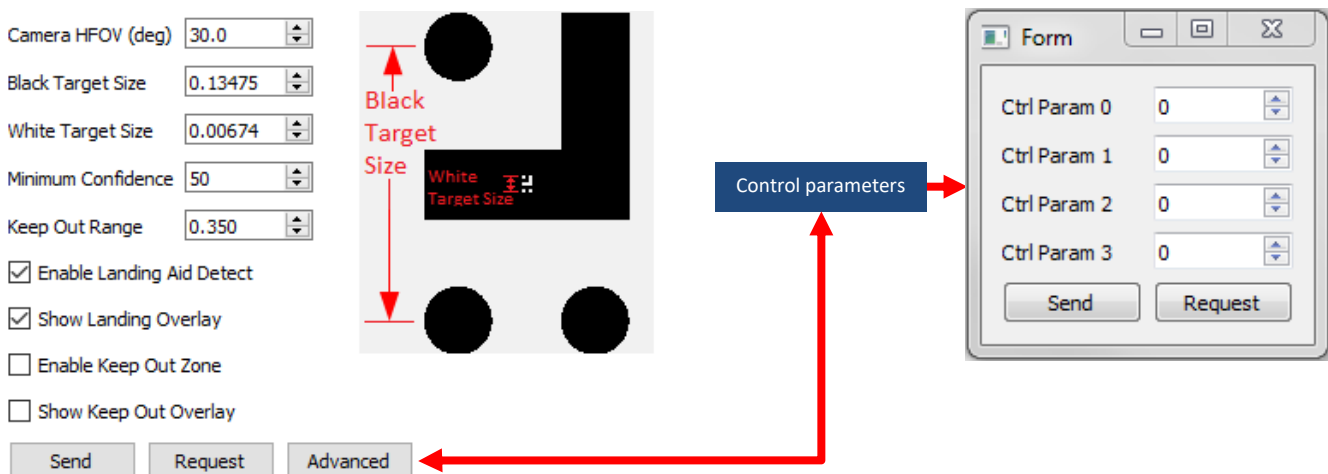

Figure 3: Control Parameters

2.4 Keep Out Zone

The keep-out region is within the circle boundary. If there are no detections found within the circle it will be green. If a detection is found it will turn red.

Figure 4 shows an example of a perimeter landing zone detection. See the Landing Aid Zone Detection video for a demonstration of this feature.

📄 *In certain detection modes the landing pad can cause detections. These can be filtered without changing the end detection state.*

Additional information about detections are available in the Landing Positions (0x83) packet in the Interface Command and Control (IDD).


Figure 4: Landing Aid Keep Out Zone

2.4.1 Keep Out Zone Configuration

1. In Panel Plus » *Tracking* tab » *Landing*. From the Landing tab, check *Enable Keep Out zone* and *Show Keep Out Overlay*.

2. Set the *Keep Out Range*. Units are the same as those used in setting up the target size.
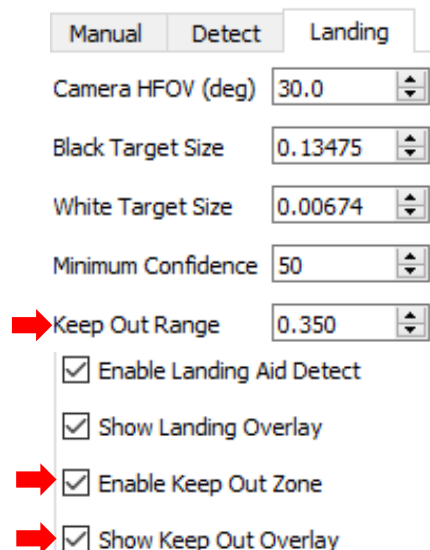
3. Click the *Detect* tab. Enable a detection mode from the dropdown menu. For more information about choosing and working with detection modes, see the EAN-Detection-Modes document.
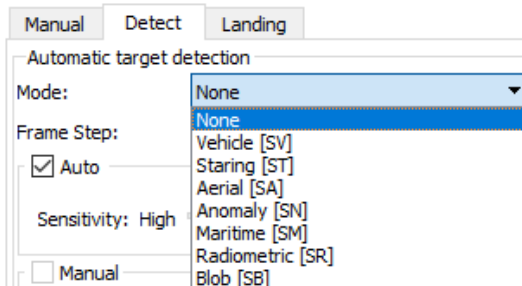
4. Verify that the detection mode is working correctly.

3   Integration with Auto Pilot (Flight Control System)

The Landing Aid feature has been tested in conjunction with Micropilot, Pixhawk, and Piccolo systems. The Landing Aid provides the location, orientation, and distance to the landing aid from the camera center. This information can be used to control the autopilot.

One method is to run a custom ARM application on the SLA hardware that uses the telemetry from the landing aid along with the telemetry from the autopilot to generate autopilot commands. The format of these commands depends on the specific autopilot. Extensive telemetry data is required from the autopilot, which is also system dependent. For example, to use the telemetry from the landing aid to drive the vehicle in a specific direction or location, the attitude of the aircraft and the mount location and angles of the gimbal must be known. This type of integration is very platform specific.

Information on creating a custom ARM application for these systems can be found on the Sightline applications website under the *ARM Processor Applications Development Example Code and Resources* section.

The EAN-ARM Application Development describes how to setup a PC to develop applications that can be run on the ARM processor of the 1500-OEM or the 3000-OEM video processor.

The SLA ARM Examples installer includes the Landing Sample application, which can run on the ARM. This example receives landing aid telemetry from the VideoTrack along with autopilot telemetry processor. The data is used to generate commands to send to the autopilot. The examples in this code communicate with the Pixhawk autopilot. Integrations have also been done with Micropilot and Piccolo autopilots. Contact Sales for more information.

The example code can run on ARM and PC systems. The PC versions compile under Visual Studio 2013. The ARM versions compile under TI Code Composer Studio. It is possible to do much of the development and test using a PC since the telemetry from the Landing Aid hardware is directed to the PC, and the commands to the autopilot come from the PC. This provides a simplified process for development and debugging. Most of the code is common to both platforms with SLA provided abstractions for Linux and Windows (sockets, serial ports, threads).

A developer that is familiar with autopilots should be able to understand the example code and integrate it with an autopilot. Contact Sales for help in locating contract developers that are familiar this sample code.

4   Questions and Additional Support

For questions and additional support, please contact Technical Support. Additional support documentation and Engineering Application Notes (EANs) can be found on the Support pages of the SightLine Applications website.

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When scaling the landing pattern, it is important to maintain the aspect ratio of the pattern and the white space area within the red border.