

Updates

An Introduction to the New ASPSuite



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We are releasing a significant update to the AirGon Sensor Package Software Suite (ASPSuite or just ASP) with the release of our new direct geopositioning system (DGPS), Loki. ASPSuite is the intermediate step between landing the drone and feeding data to the Structure from Motion (SfM) software (PhotoScan, Pix4D, DroneDeploy and etc.).

ASPSuite is available in two licensing levels, Standard and Advanced. The Standard level is useful when you are not using a Loki DGPS on your drone. It provides tools to help you manage flights and, more importantly, to fix some errors that DJI makes in assigning altitudes to images; if the altitudes of your flight are not approximately correct, your automatic camera calibration software will resolve an incorrect focal length. It also will geotag images as a final processing step. ASPSuite Standard edition is included with the Bring Your Own Drone (BYOD) Mapping Kit. ASPSuite Advanced Edition adds drivers for RTKLIB, the software we use for obtaining the DGPS solution as well as tools for geotagging images and correcting event mismatches. ASPSuite Advanced edition is included with each Loki package. Additional licenses of both levels can be separately purchased.

ASPSuite is our first software package to use a new licensing system from Reprise Software called Reprise License Manager (RLM) and our second package to use automatic web-based software updates (AirGon Reckon being the first). The current version of ASPSuite (2017.2) is licensed in *Roaming* mode only. This means that you can load the software on as many devices as you like (it runs on Windows 7 and Windows 10). You then, via the integral License Manager, *check out* a license to the machine you wish to use for up to 30 days. You can check the license in at any time you like. Check in and check out require an internet connection. No connection is required for licensing while running ASPSuite although you will need to connect for other actions such as downloading data such as satellite ephemeris. The License Manager is depicted in Figure 1. The license currently checked out is indicated in the left-hand section of the pane. The status of your license pool on the license server is shown in the right-hand pane. In my example, I have an Advanced License checked out for 2 days. The right-hand pane indicates that I have 10 standard licenses with none checked out and 20 Advanced licenses with eleven checked out. The actual license pool is maintained on a cloud-hosted server that you connect to via the ASPSuite License Manager. This style of licensing is termed “Roaming” because, once you have checked out a license, you can “roam” your machine without needing a connection to a network or the internet.

Updates

An Introduction to the New ASPSuite

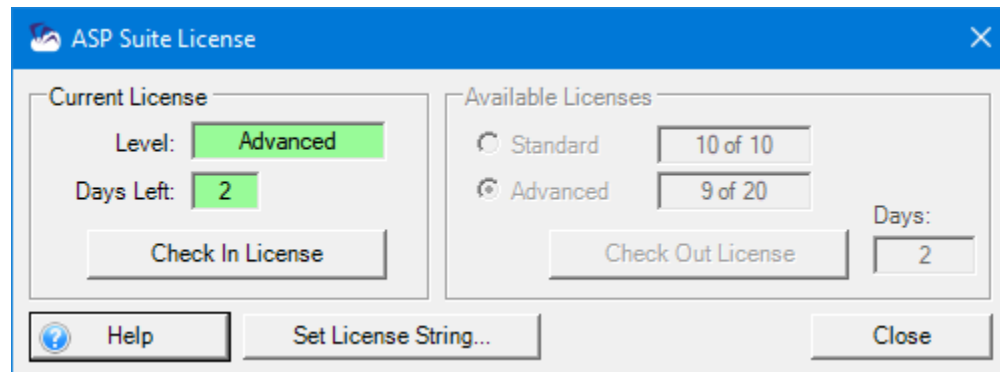


Figure 1: ASP Suite License Manager

ASPSuite performs the following steps:

- Ingest of the project data from the drone and (optionally) Loki DGPS.
 - Base station RINEX file
 - Loki raw file (this is in Septentrio format)
 - If operating in the USA and using the Online Positioning User Service (OPUS) to position the base station, the body of the OPUS solution email
 - Images from the drone
 - Download of ephemeris data from the web (this is done semi-automatically with a 'download' button)
- Conversion of data to the formats needed by RTKLIB, the trajectory solution software
- Creation of the Global Navigation Satellite System (GNSS) post-processed kinematic (PPK) trajectory file (see Figure 2). This file contains a row per solution containing the time, the position (X, Y, Z) and the quality Q (1 is a "fixed" solution). The Loki sampling rate is 10 Hz, yielding 10 rows for each second that Loki is active and locked on to sufficient satellites to resolve a solution. There are also rows of *Events* in this file. An event is logged each time Loki detects a Mid Exposure Pulse (MEP) from the camera MEP input. This event is simply a time stamp. It is not necessarily on a 10 Hz boundary so a later processing step has to interpolate the position associated with each event.

Updates

An Introduction to the New ASPSuite

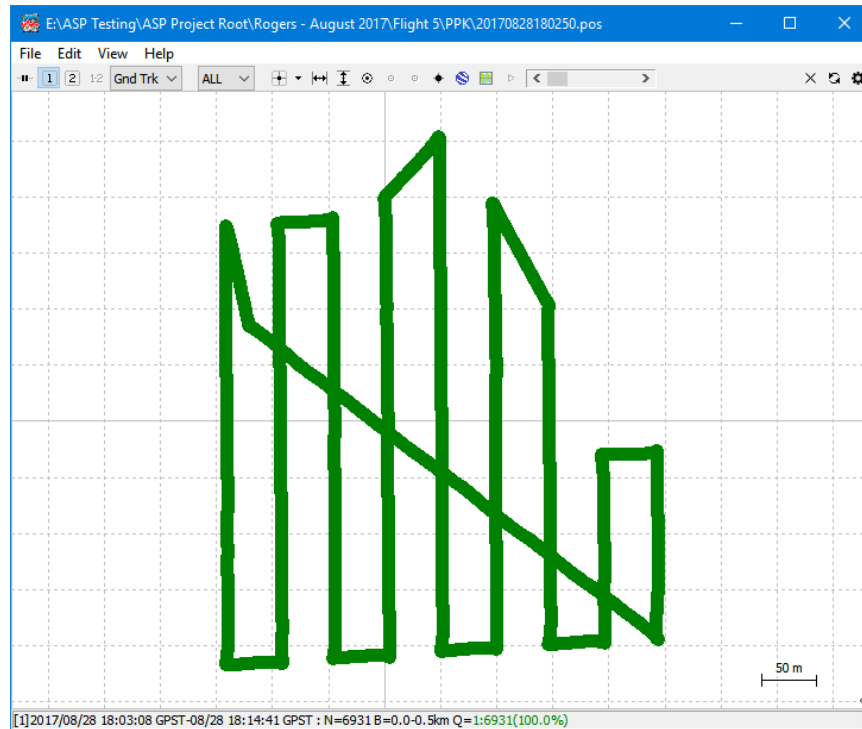


Figure 2: GNSS PPK Trajectory File

- Event Interpolation – In this step, event positions are interpolated from the trajectory file (we use a cubic spline routine for this interpolation), leaving a list of events, time and interpolated positions. This is initially the position of the phase center of the Loki GNSS antenna each time a MEP occurred. The position is then corrected by the lever arms (the X, Y and Z offsets between the phase center of the antenna and the camera focal center). If the attitude of the aircraft is available (which it is in the case of the Phantom 4 Pro and the Inspire 2), a dynamic correction is applied which compensates for the effective distance changes caused by Pitch, Yaw and Roll of the aircraft. On the DJI craft, the focal center of the lens is conveniently located in the center of the gimbal so no additional gimbal computations are required. An example of the events interpolated from the trajectory of Figure 2 is shown in Figure 3.

Updates

An Introduction to the New ASPSuite

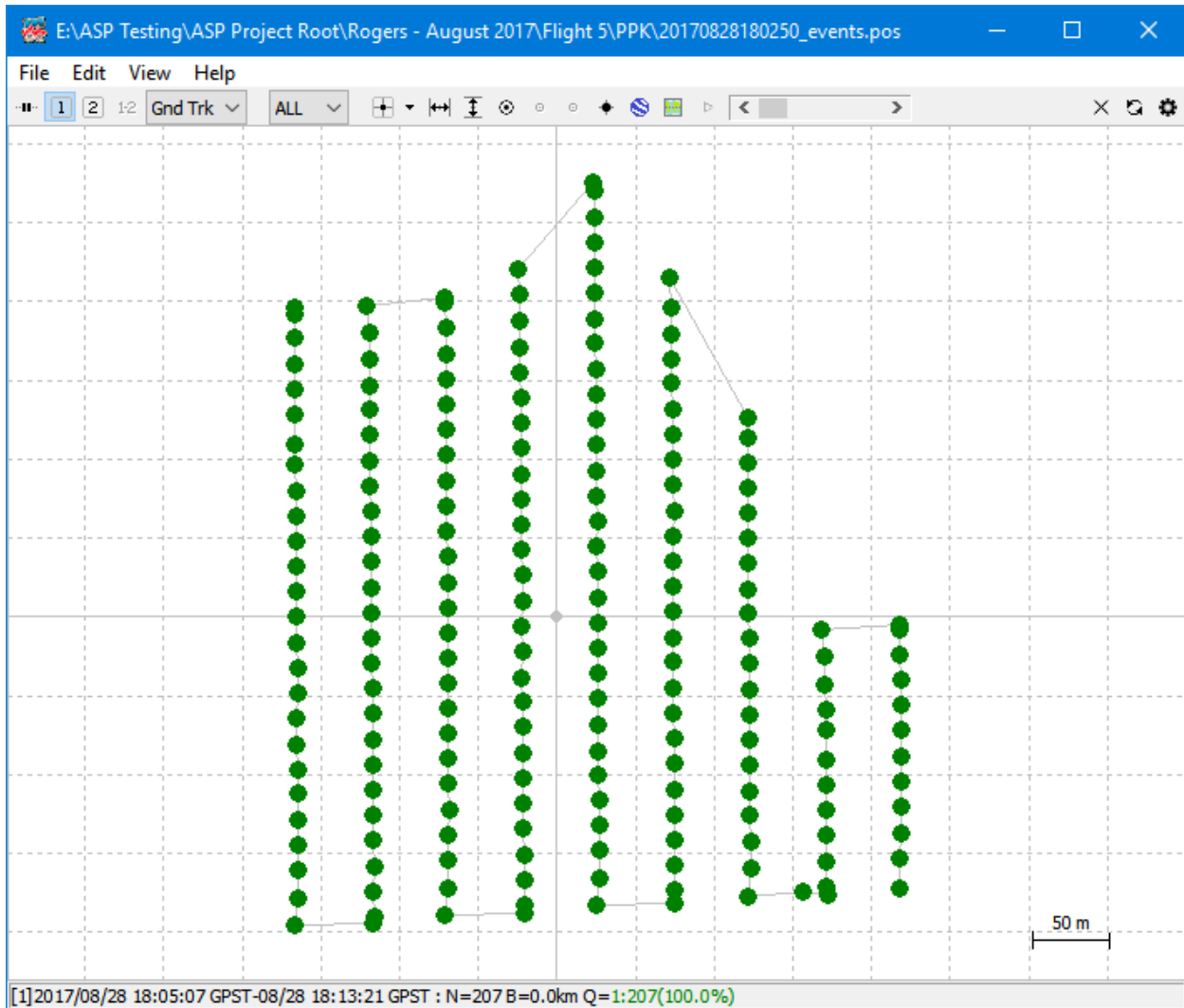


Figure 3: Interpolated Events

- The final step is “Geotagging.” In this step, ASPSuite correlates events with photos. Under normal circumstances, the number of detected events should match the number of images acquired during the flight. In this case, events are matched to photos in sequential fashion. If the number of events does not match the number of photos, a manual resolution will have to be conducted. ASPSuite includes a tool for this. The updated photo positions can be written directly into the image header Exchangeable Image File Format (EXIF) fields. A text version of this information is always created. This final information is the goal of Loki – image positions at the time of exposure to centimeter accuracy (assuming a good, fixed solution throughout the flight). If you are not using Loki, you will have images tagged with locations accurate to the navigation grade GNSS of the drone autopilot (meter accuracy).

Updates

An Introduction to the New ASPSuite



We have added a bit of project and flight organization to the 2017.2 version of ASPSuite. I would consider this initial data management to be very basic with more features to come in future releases. Many drone mapping projects comprise multiple flights either because of battery limitations or areas of interest that are physically separate. For example, we fly a papermill where the data of interest are a feed stock wood chip pile and then a separate area of log piles. This results in one project with two or three flights (depending on the size of the log pile areas).

The 2017.2 scheme is to establish a *root* directory under which your drone projects will be stored. Under this *root*, ASPSuite will establish a directory for each *Project*. Under each project folder, a *Flight* folder is created for each flight in the project. Finally, a series of folders for different types of data is created under the Flight directory.

Creating a Project and Flight using the Project/Flight Wizard is shown in Figure 4. Notice my root directory in the ASP Projects Root Folder section of the dialog (“E:\ASP Testing\ASP Project Root”). Until I change the root, all of my projects will be created under this parent directory. My new project name is “Rogers – August 2017” and I have very creatively named my first flight “Flight 1.” In reality, you can use meaningful names such as “North Stockpile Area.”

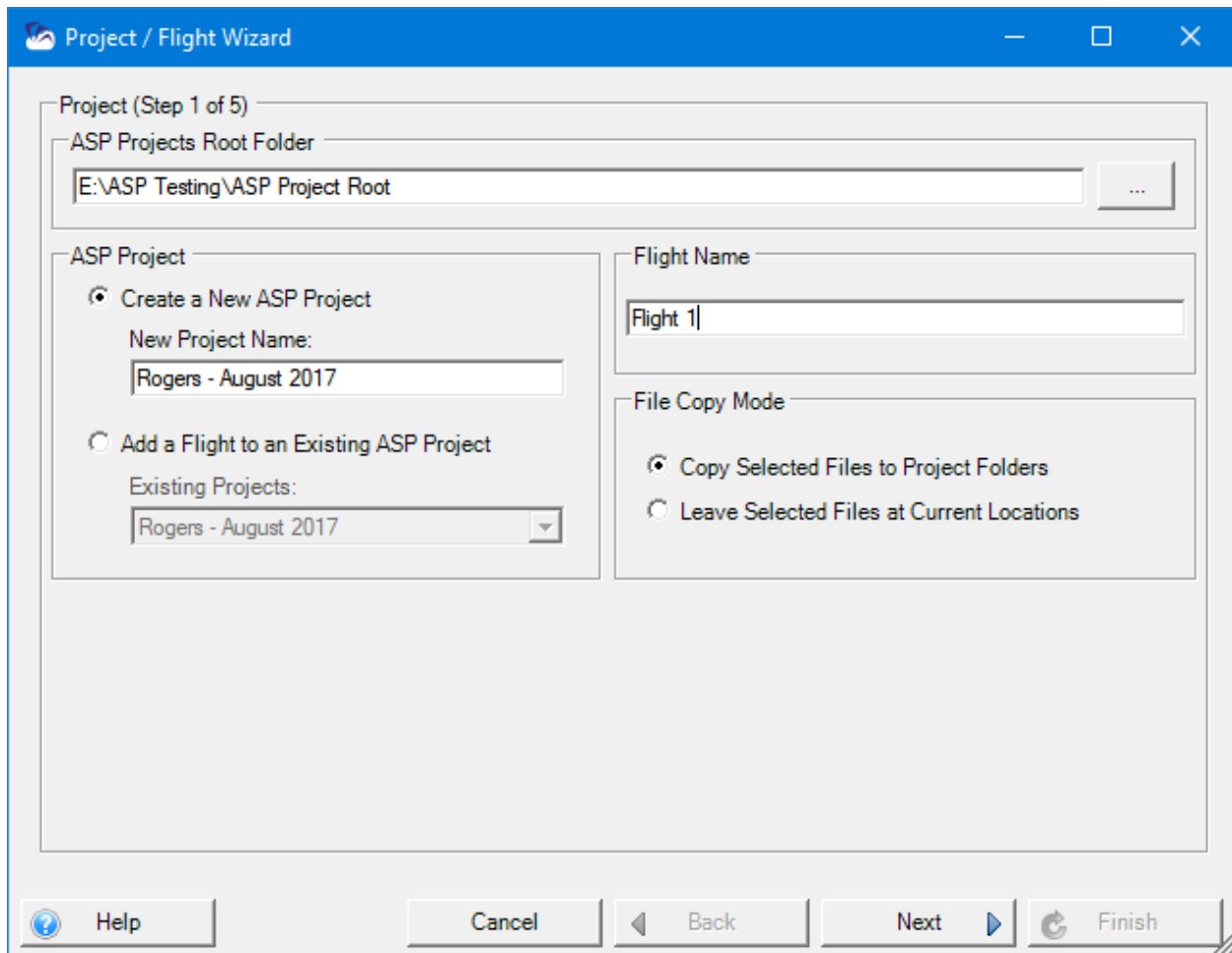


Figure 4: Creating a Project and Flight

You can choose to leave the source files on the drone and Loki in place or move them to your project folder. This option is selected in the lower right area of the dialog of Figure 4.

NOTE: A good best practice is to connect two USB cables to your drone after each flight. For a DJI drone, this will be the USB cable that was provided with the drone as well as the Loki USB-C cable that was included with your Loki system. Set the option of Figure 4 to “Copy Selected Files to Project Folders” and then, during the course of running the Wizard, the source files will be copied from the drone (image files) and Loki (GNSS data) to your processing computer. At the same time you are running the ASPSuite, the Loki will be charged via the USB-C cable.

The easiest way to process a flight is with the Create Project/Flight Wizard. This is a multi-step dialog that leads you through loading all the data needed to process a flight. Some data are common to the entire set of flights and are remembered by the Wizard (such as the base station location). Once all data are loaded, you can perform processing via the “Solve – Auto Run” button or the “Solve – Single Step”

Updates

An Introduction to the New ASPSuite



button (see Figure 5). The Auto Run option will perform all processing steps, leaving you with geotagged images (if you selected this option) as well as the text file containing the geotagging information. The geotagged text file is for SfM applications that do not understand EXIF data or for situations where you are doing something other than SfM such as setting stereo models. The Single Step option allows you to run each of the (currently 5) processing steps individually. You can back up step by step using the “Undo” button indicated by the mouse cursor in Figure 5.

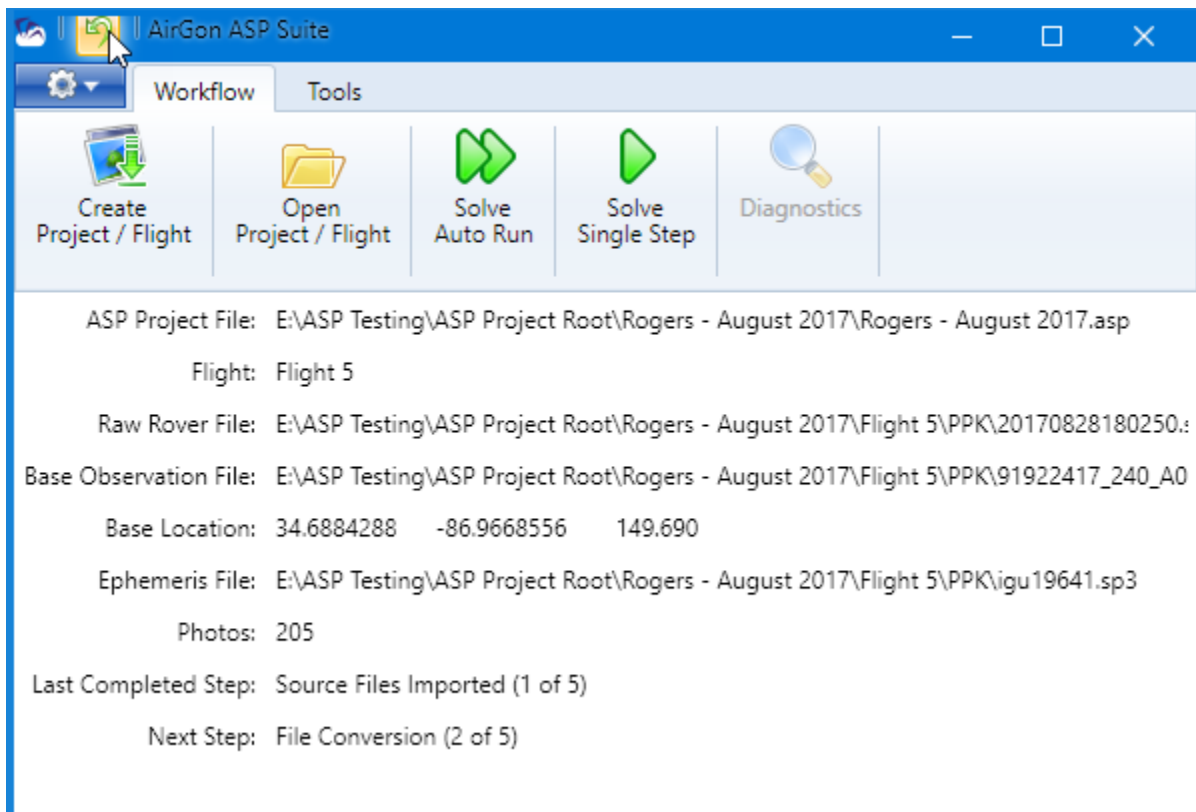


Figure 5: Processing in ASPSuite

In future articles, we will explore each of the processing areas of ASPSuite in more detail. We will also publish a special article on solving image-event mismatches. In the meantime, the Standard version of ASPSuite is taught as part of the BYOD Mapping Kit training and the Advanced as part of the Loki training.

ASPSuite is a work in progress so you will see rapid changes throughout the remainder of 2017. With our new auto-download feature, these updates will be directly available to you by simply choosing “yes” when asked if you want to install the update. As a precaution, I strongly recommend that you always answer yes to the update questions since we may be publishing a fix to an error!

As always, we very much encourage your feedback on this and all the other AirGon/GeoCue products.