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Using HYPACK® for Photogrammetry

By Ken Aiken

HYPACK® LiDAR data and the corresponding photographic images captured by HYPACK® SURVEY can be exported to 3rd-party Photogrammetry programs to produce RGB point cloud files, color-coded according to the colors in the image files, as well as orthomosaic geo-TIF files derived from the captured images of your project area.

You can then load both output file types back into HYPACK® to provide a high-resolution representation of your project area. In the HYPACK® CLOUD program, you can display the point cloud using the RGB colors to show to display it in realistic colors. Including the geo-TIF as a background chart further enhances the display.

NOTE: At this time, the Orthomosaic geo-TIF is only useful in HYPACK® if it is derived from images shot from overhead as from a drone. Images shot from the side can be used to create a geo-TIF; however, it cannot be used as a HYPACK® chart file.

SURVEY

There are currently 3 camera driver options for acquisition:

- GoPro_Capture driver (gopro_capture.dll), which works with the GoPro Hero 3 and 4 model cameras;
- Canon Camera Interface driver (canonIntf.dll), which works with and EOS Canon camera;
- FLIR Thermal Camera driver (FLIRThermal.dll), which works with the FLIR Vue Pro and Pro R models.

POST-PROCESSING

In preparation for processing, copy your image files together with the image log (ImageLog.LOG) into a single folder.

Tip: Typically, you make a folder in your project folder to keep the pictures together with the relevant data, but the image folder can be elsewhere.

Once you have processed your data in MBMAX64 (64-bit HYSWEEP® EDITOR) to stage 2, you can display the corresponding image files in the Camera Log window.

1. **Open the Camera Log window.** Click [More Windows] and select Camera Log.
2. **Under Log File, select the image log file** from your survey.
3. **View your images with your survey data.**

The Camera Log window is synchronized with the Survey window display. You can click through the images in the Camera Log window and the marker in the Survey display updates to the position of the survey vessel (boat or drone) at the time the image was acquired. If you click in the Survey window, the Camera Log window will show you the image closest to that position.

4. **Adjust the JPG timestamp, as necessary.** Sometimes there is a timing difference, as the cameras can lag a little, so you can manually adjust the image timestamp. Enter a JPG Time Adjustment in hh:mm:ss format, then click the check mark.
5. **Import the metadata from the image log file to the JPGs**. Click the Georeference Images icon to embed the position and attitude data from the raw data into the metadata for each image based on the timestamp. You can add georeferenced images to your HYPACK® project. In the HYPACK® Map window where they display as pin points that you can query. You may also import them into a photogrammetry application.

FIGURE 1. *Drone Survey of the HYPACK Office—Camera Log Window*

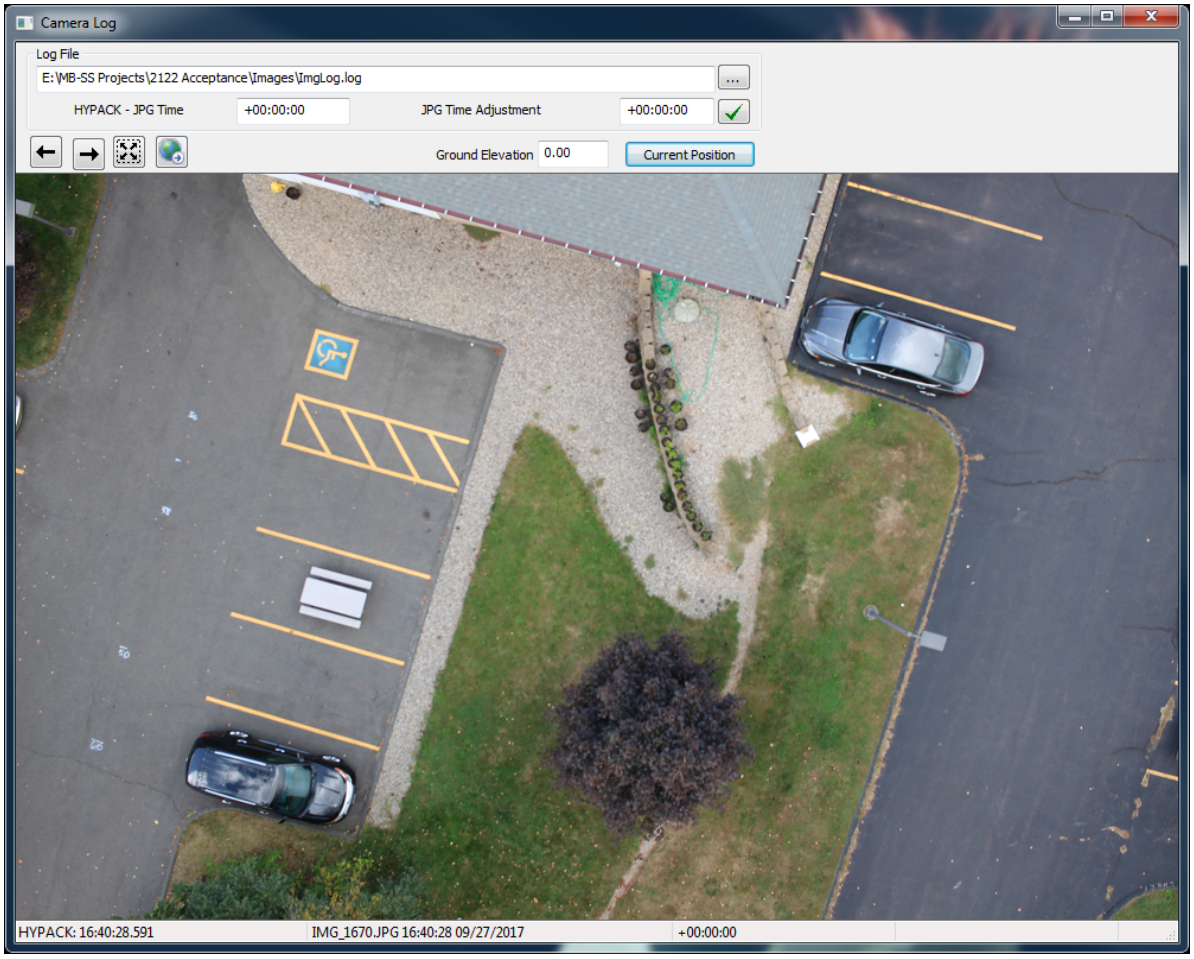
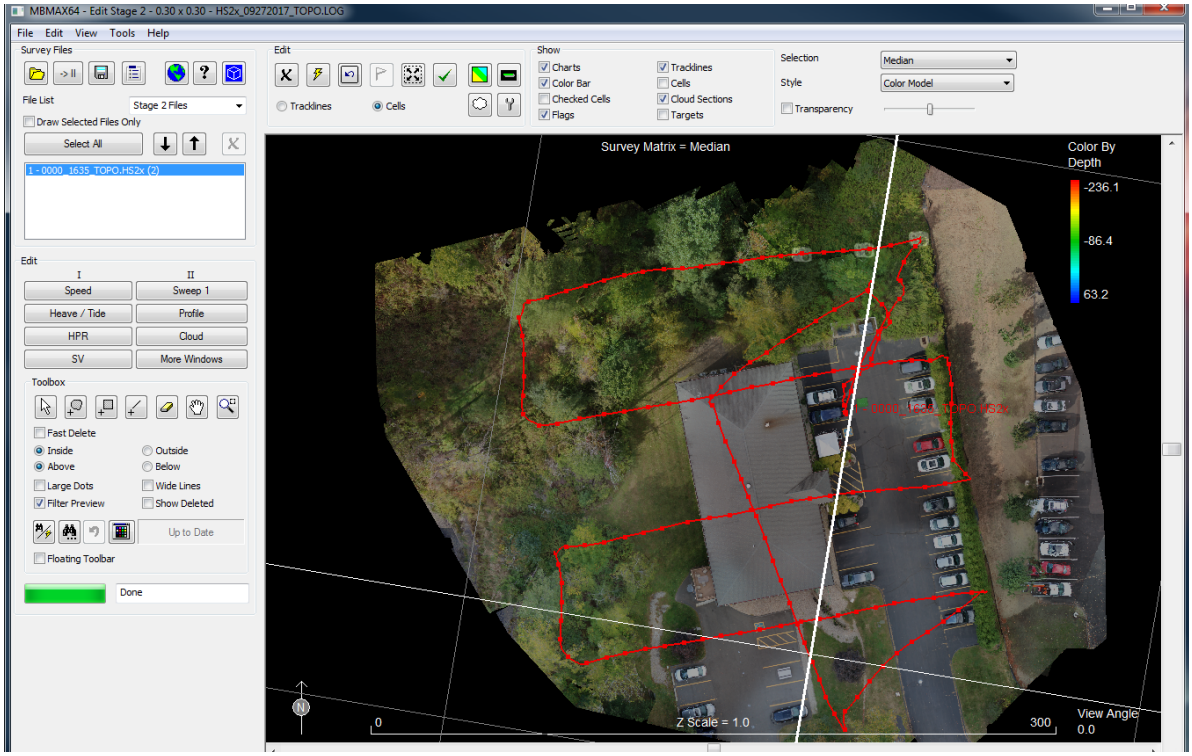


FIGURE 2. *Drone Survey of the HYPACK Office—MBMAX64 Shell*



IMPORTING YOUR IMAGES INTO PHOTOGRAMMETRY SOFTWARE

PIX4D

To process your images with Pix4D you have 2 options, each with advantages and disadvantages:

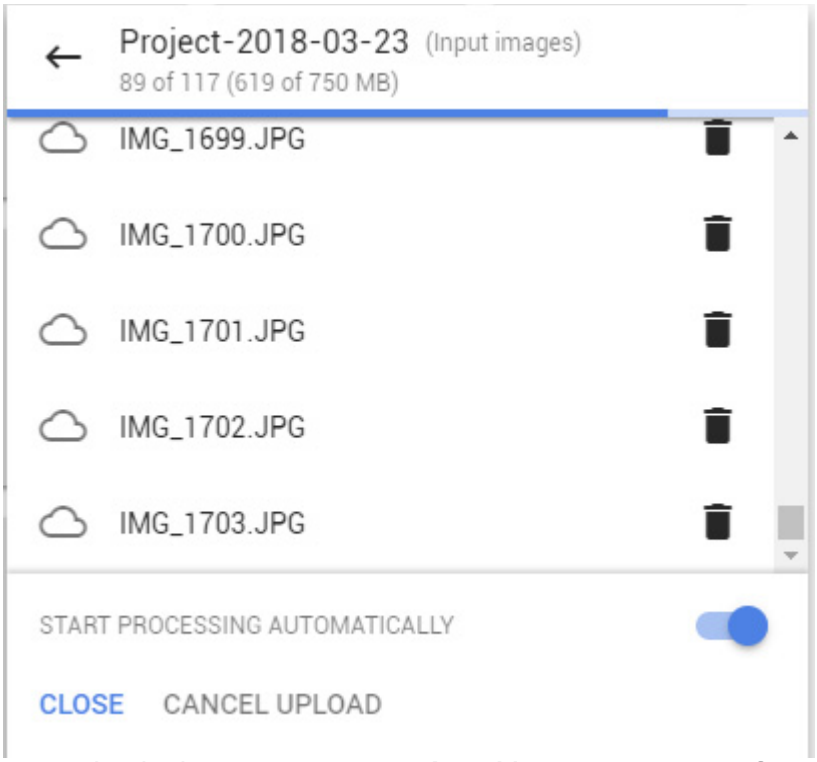
- **Pix4D Cloud** is simple to use but processing speed may be affected by the capabilities of your computer and the Internet connection.
- **Pix4DMapper,** the desktop application, is a lot more robust, but there's a small learning curve. You can also import an XYZ or LAS file from HYPACK® to act as Ground Control Points, increasing the accuracy of the photogrammetry results.

PIX4D CLOUD

1. **Upload your images.** (This takes some time.) You'll need to leave your browser open and connected to the Internet while they upload. For 117 pictures, upload plus processing was about 2.5 hrs..

Tip: If you check the **Start Processing Automatically** option in the upload dialog, Pix4D starts processing the images automatically when the upload is complete.

FIGURE 3. Pix4D Upload Dialog



2. When the processing is done, **export your data.** You can export two formats:
   - **LAS point cloud**
   - **Orthomosaic geo-TIF**

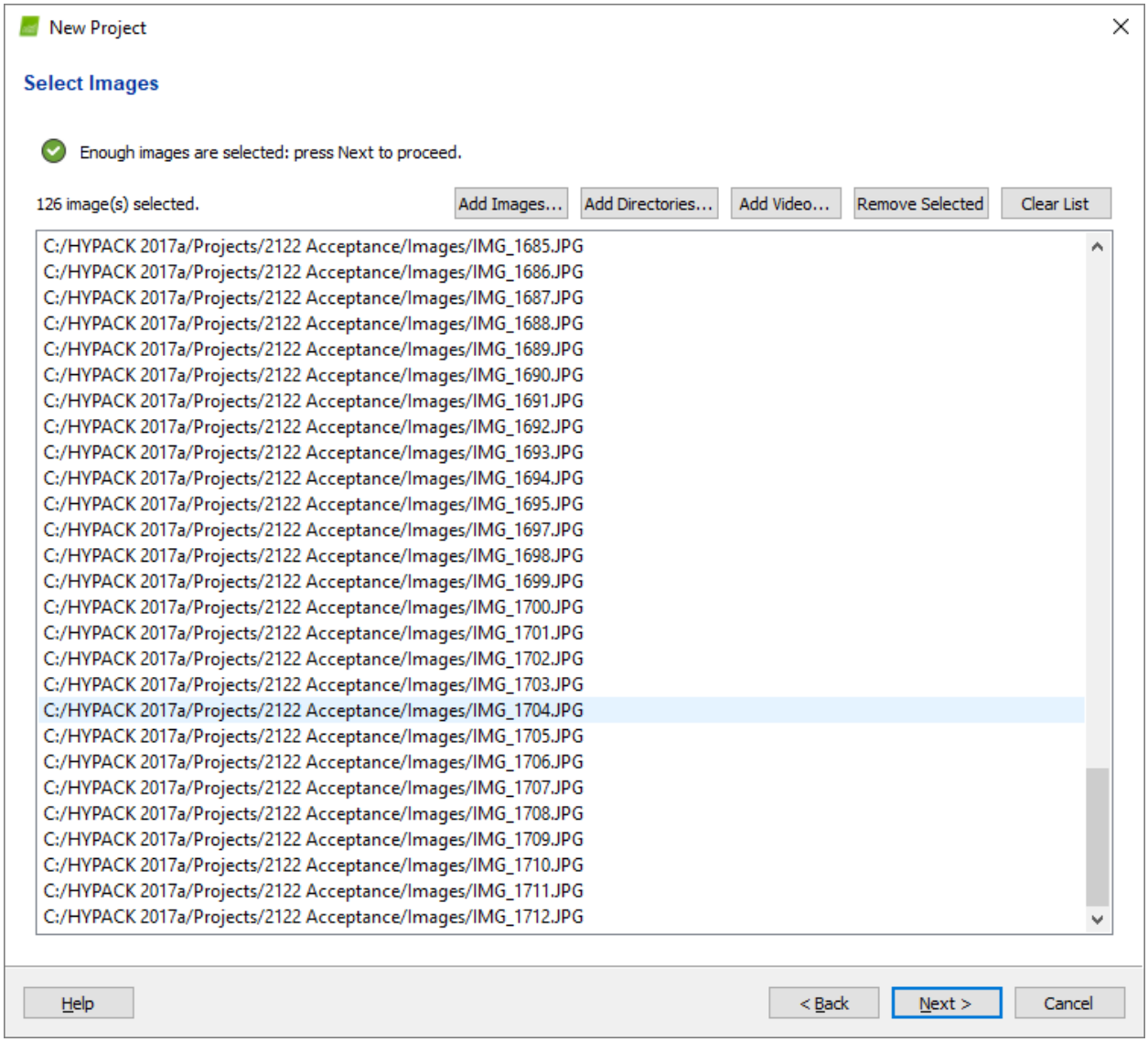
   You can load one or both formats back into HYPACK®, or into Pix4D Mapper to use more advanced features.

Pix4D Mapper

While Pix4D Mapper has a lot of features, I'm not going to explain in depth, because I don't know them well enough; however, I will show you the basics.

1. **Create a new project**.
2. **Select your images**.

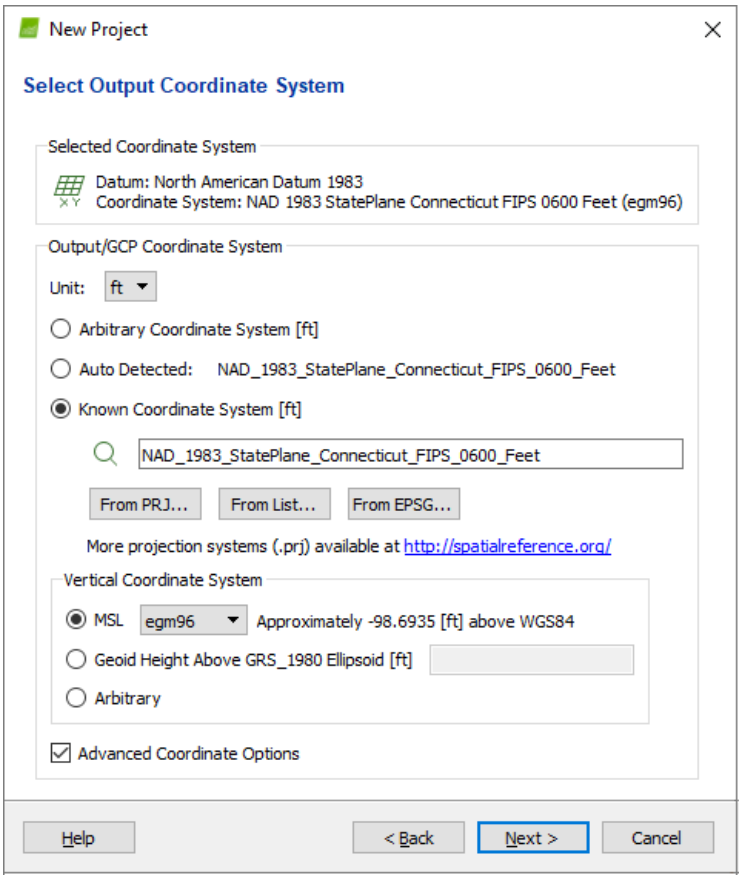
FIGURE 4. Loading your Images to Pix4D Mapper



3. **Set up your Coordinate system.** Set it as close as possible to your project geodesy.

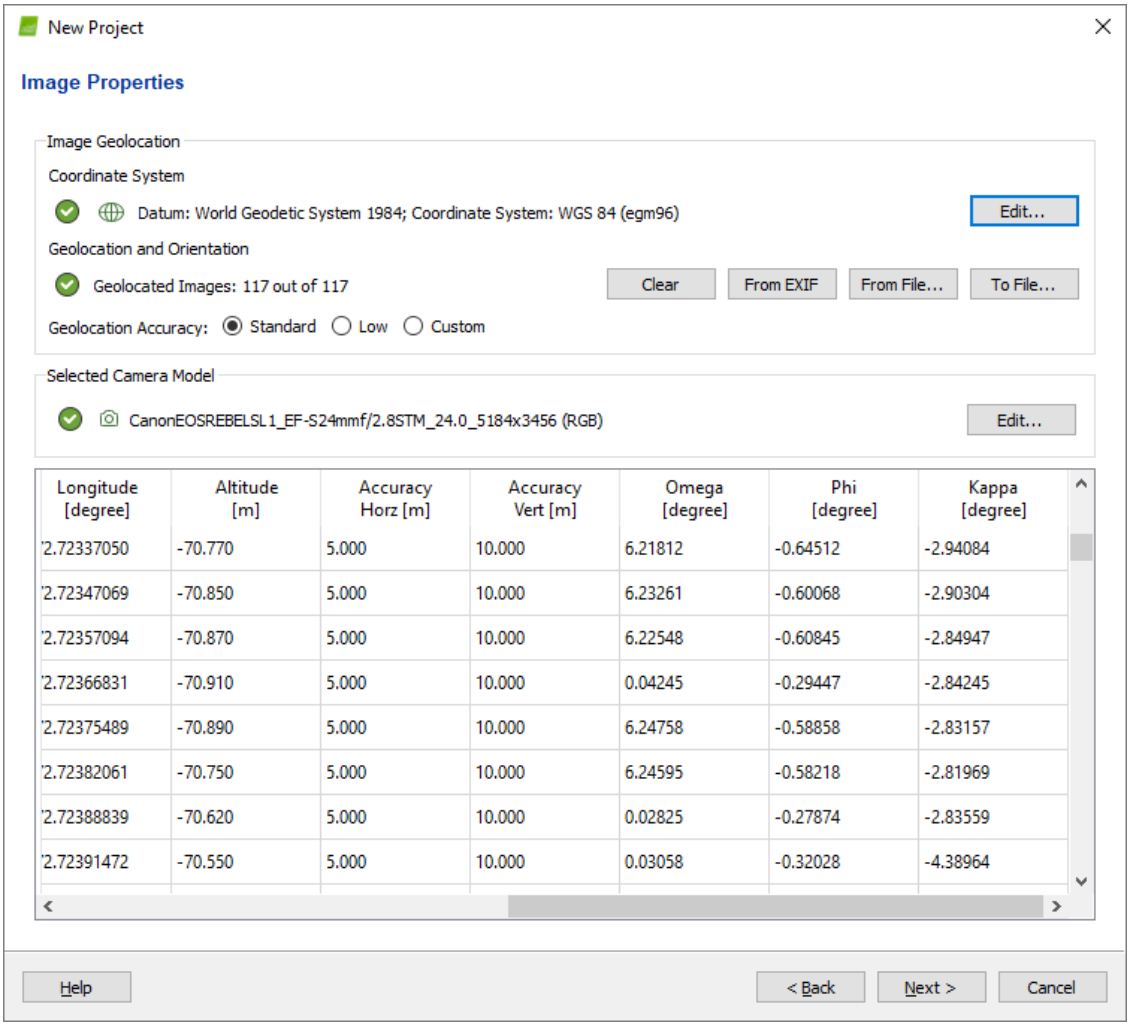
Tip: Alternatively, you can use your UTM zone, then use the HYPACK® PROJECT CONVERTER to convert the Pix4D output data from the UTM zone to the exact HYPACK® project geodesy.

FIGURE 5. Configuring your Geodetic Coordinate System



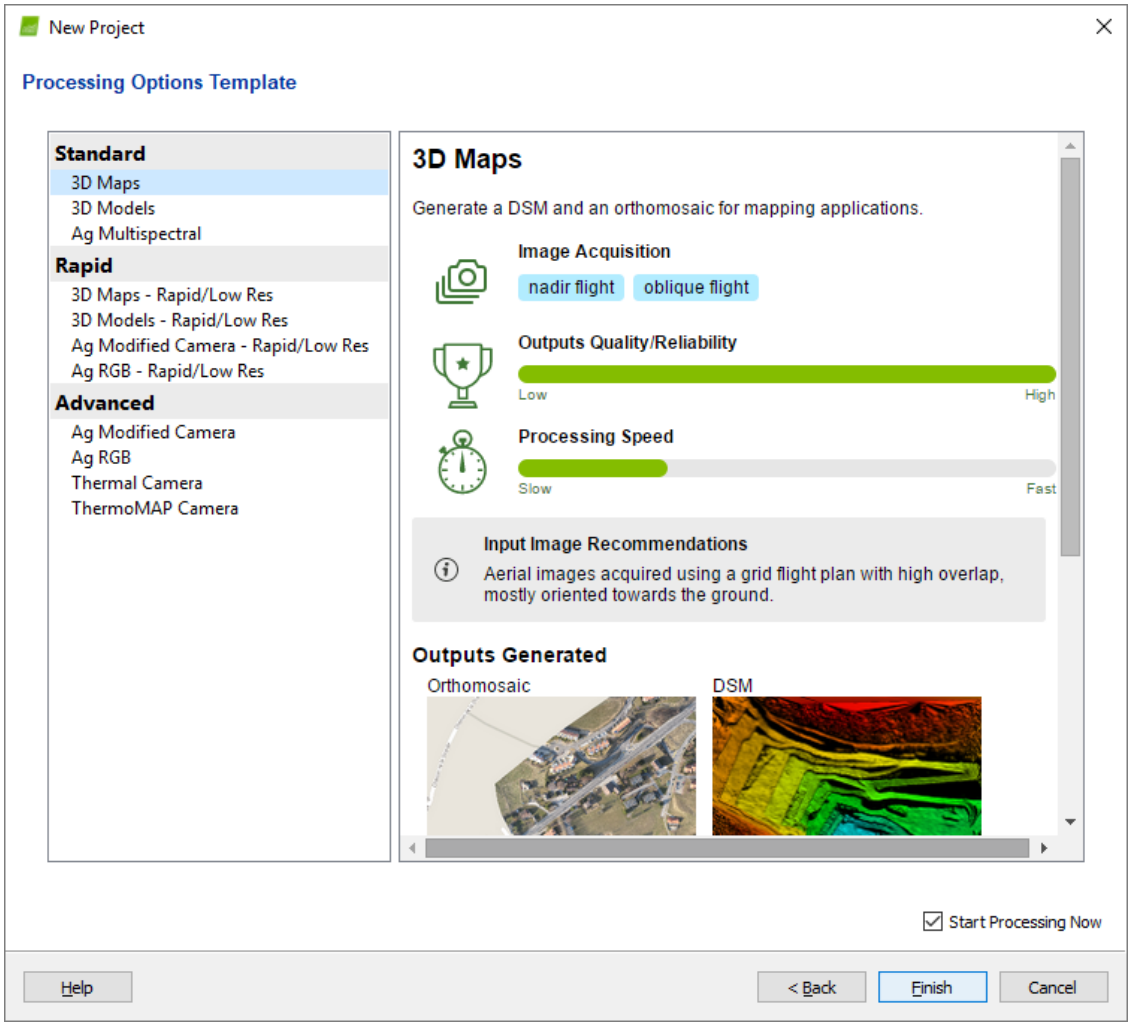
4. **Review your image properties.**

FIGURE 6. Reviewing your Image Properties



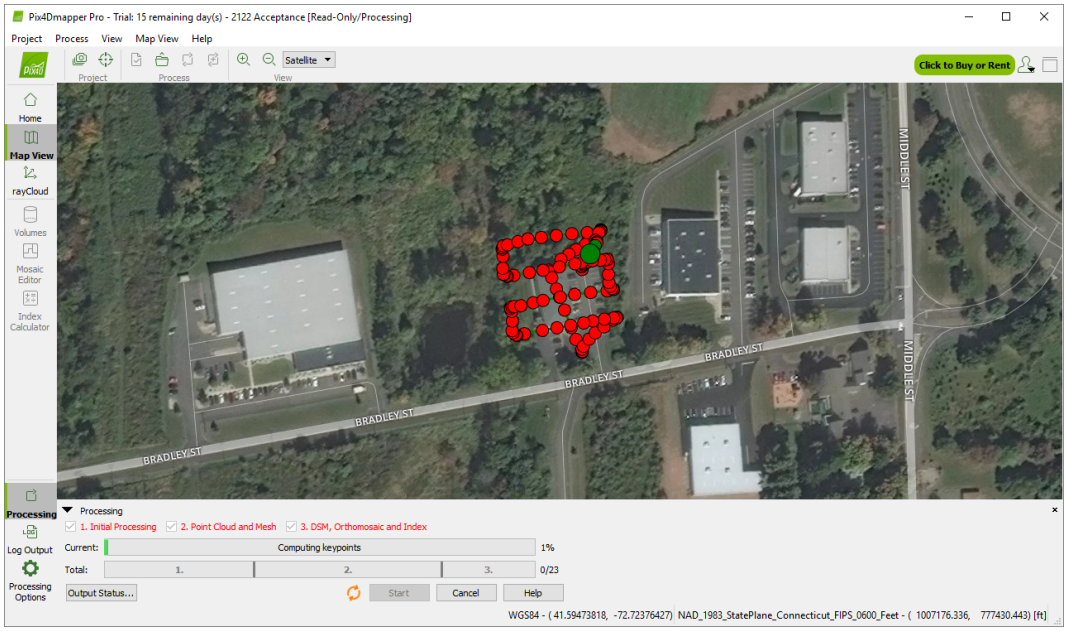
5. **Set your processing options.** There are several:
   - If you are using a **Canon or GoPro** camera, you will probably just select 3D Maps in the Standard options.
   - If you are using a **FLIR**, there is also a thermal option in the Advanced options.

FIGURE 7. Processing Options



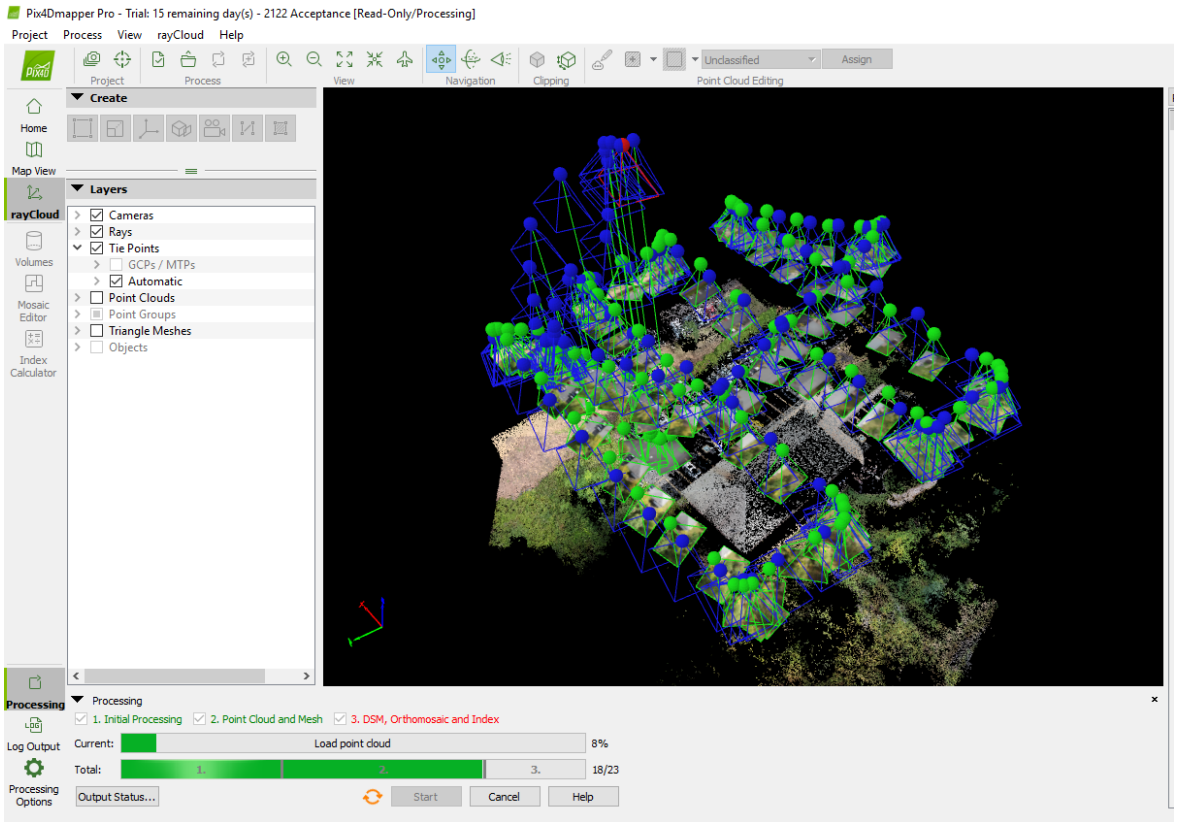
6. **Check Start Processing Now and click [Finish].** Processing can take a couple of hours.

FIGURE 8. Processing your Images



When the processing is done, Pix4D Mapper generates a quality report and you can see your results in Pix4D Mapper.

FIGURE 9. Final Processed Data in Pix4D



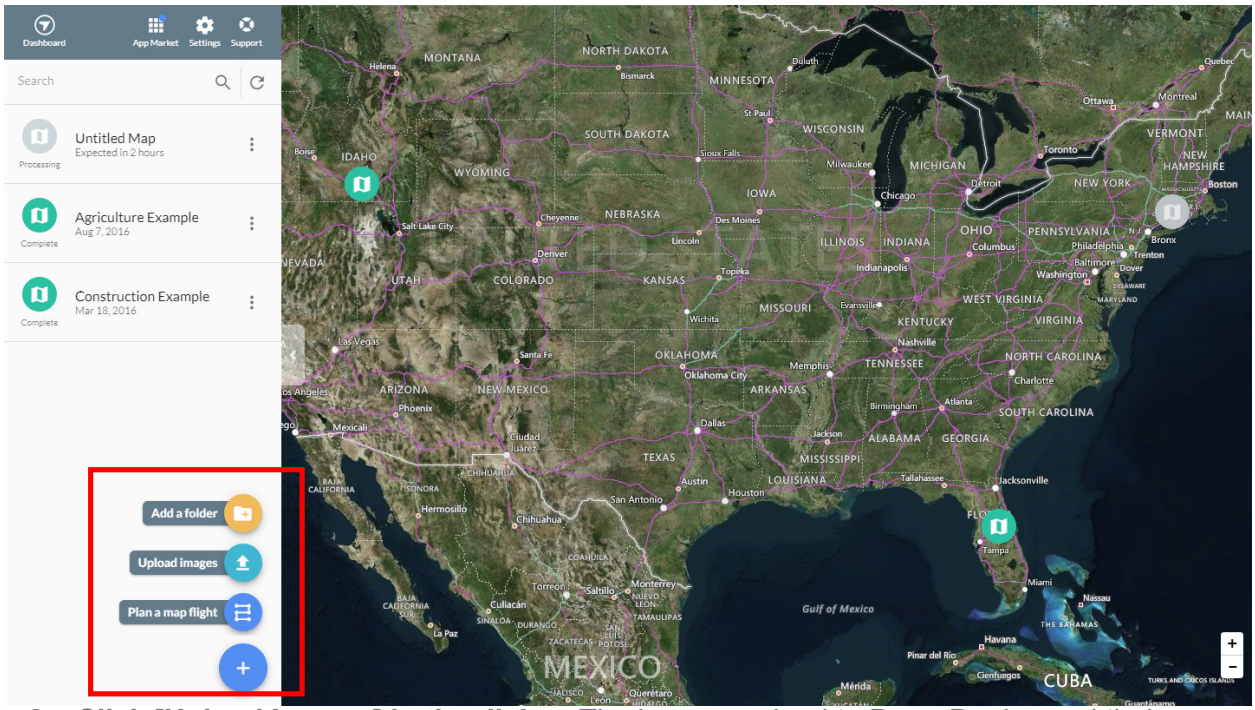
7. **If you want to bring your generated files into HYPACK®, export the results**. Select PROCESS-OPEN RESULTS FOLDER.
   - **For a point cloud**, select the \2_densification\pointcloud folder, and the output will be saved there as an LAS file that you can open with MBMAX64 or CLOUD.
   - **For a geo-TIF**, select the 3_dsm_ortho\mosaic folder and copy the TIF and TFW files into your HYPACK® project. You can then use the TIF as a background chart.

DRONEDEPLOY

DroneDeploy is fairly straight forward:

1. **Go to DroneDeploy.com and log in**.
2. **Upload images to the site.** On the dashboard, click the '+' on the lower left-hand corner and then "Upload Images". A dialog appears where you can select your image files and, optionally, a set of ground control points. (DroneDeploy explains how to format ground control points https://support.dronedeploy.com/docs/gcp-csv-file-formatting.)

FIGURE 10. *DroneDeploy Interface*



3. **Click [Upload Images] in the dialog.** The images upload to DroneDeploy and their servers process the data. This may take a while, for 117 images from a Canon camera it took about 2 hours.
4. **Export your orthomosaic and point cloud**.

FIGURE 11. Point Cloud of Camera Location of each Image

FIGURE 12. Geo-TIF Output

NOTE: Unfortunately at this time HYPACK® doesn't support the compression used by DroneDeploy for their geo-TIFs. To fix this, open the image in Paint and re-save it with the same filename.

FIGURE 13. *Point Cloud Calculated from the Images in DroneDeploy*

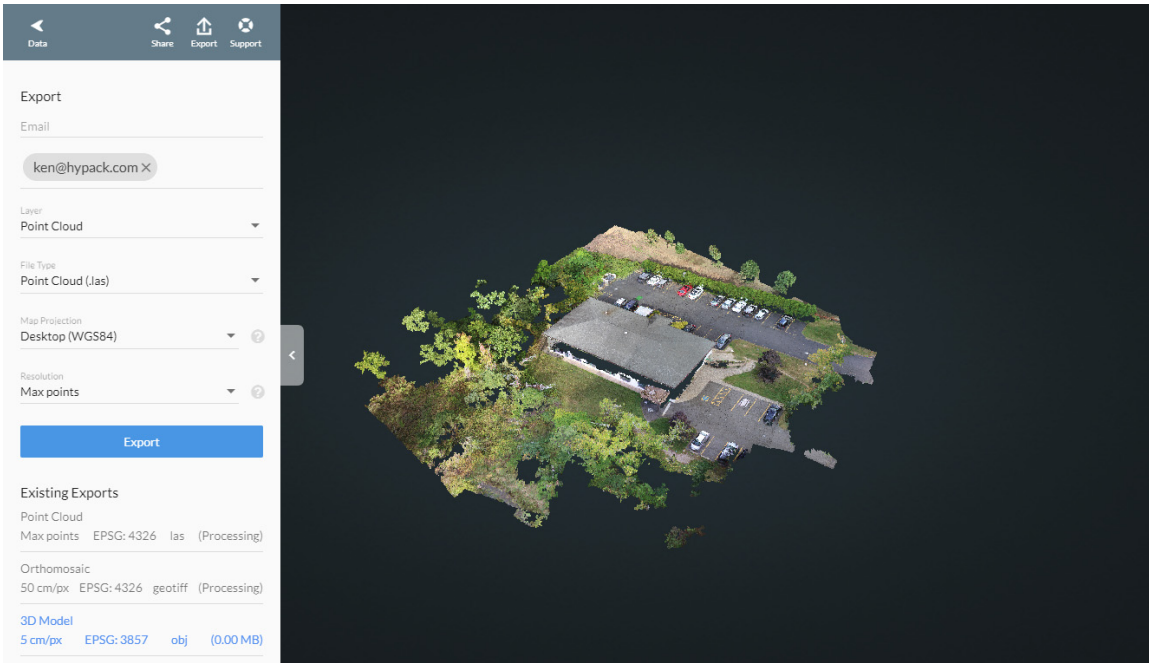


FIGURE 14. *LAS Point Cloud Exported from DroneDeploy and Loaded into HYPACK® CLOUD*