BASICS OF PROCESSING FIRE IMAGERY
OBJECTIVES

• Demonstrate the workflow for processing photos and deriving data products using photogrammetry
• Converting TIFF files to JPG for viewing
• Sorting Photos
• Be able to set up Photoscan
• Load Photos
• Run Processes to create basic products
PURPOSE

• This Presentation is to provide the user with a very basic step by step
• The spatial accuracy of map products will be only as good as the aircraft GPS provides
CONSIDERATIONS

How were the photos collected?

What were the time intervals?

What altitude above the highest point?

What format if thermal images were collected? (TIFF preferred)

Which camera profile was used to collect? (Flight must use narrowest camera needed)
CONSIDERATIONS USED IN THIS PRESENTATION

• This presentation uses the Skid Fire as an example
• Flight was 2500’ above the highest point in terrain
• Flown with the Silent Falcon and FLIR Duo camera
Photos are in the folder to view and begin sorting. Note this folder has 2836 images. Images are geotagged and data is in the Exif. Make a copy of this folder to work from.
Select all photos in the folder then drag and drop into the Photos Pane of Metashape.
SORTING PHOTOS

In the model pane if the Camera is highlighted each image will appear as a blue dot. Note a large number of photos are not in the fire area, they were taken during the climb, descent, approach and departure from the fire.
SORTING PHOTOS

Determine an appropriate point to cut the lines of photos. In this example it will be just outside the fire area. Photos are named using date and time stamp. Scroll in close to the point of breaking the flight line and you will see the names. Select a photo and take note of it and the direction of UAS travel.
SORTING PHOTOS

Locate that image in the folder. In the previous slide we know that the UAS was enroute to Home. Also can confirm by location of image in folder, its \( \frac{2}{3} \) down. Highlight from that image to the bottom and delete. Note this deleted 821 images. Repeat for the beginning of the flight.
We are now left with 965 from the original 2836. This can be further refined using 2 methods. First use the ODS to determine the time interval between images for the flight. In this example the Capture Interval was 11.92 seconds. We can take every fifth photo since this was 2 second triggers.
Second, open the image in Windows Photo Viewer. Locate a landmark that is easily seen. Press the forward button to the next image and cycle to watch the landmark move. Estimate the Overlap. Close to 66% (landmark in 3 photos) is needed to process, in steep terrain more may be needed.
In this example it was determined that every 5th photo would be close to 66% overlap. Now there are only 194 images left to process.
VIEW AND SORTING IR PHOTOS

- TIFF formatted images will appear black, data is present just not visible
- If visible thermal images are needed convert to JPG using ImageJ
- Recommend not processing JPG images, use for viewing only
- Same process is used for sorting
- IR images use same naming conventions, use the same image numbers to cut the flight lines as used in the EO photos
This folder contains 970 TIFF images.
To actually view the TIFF format needs converted to JPG.
Converting loses the temp data embedded in the TIFF files.
JPG is a compressed format that is undesirable for deriving data.
1. Organize folders
2. Open ImageJ from its folder
3. Process > Batch > Convert
4. Select Input and Output folders as shown
5. Set Output Format to JPG
6. Convert
Now thermal images can be viewed and sorting determinations can be made. Once determinations are made sort the TIFF files in the same way.
METASHAPE FLOW OVERVIEW

- Load Photos
- Alignment - Geometry is used with geotags to build a sparse point cloud
- Refine - Improves the spacial accuracy of the model
- Gradual Selection - removes points with bad geometry
- Build Dense Cloud - Builds a dense point cloud based on remaining points in the sparse cloud
- Build DEM - Needed to generate the Orthophoto
- Build Orthos
- Export desired products
Setup the Workspace and organize the 5 panes as below. This maximizes efficient workflow. Panes can be tricky to manipulate, once placed will be saved.
Once setup and arranged the program should appear like this.
STARTING THE PROCESS

Select all EO photos for the model then drag and drop from folder into the Photos Pane.
STARTING THE PROCESS

Select all IR photos for the model then drag and drop from folder into the Photos Pane. Note how the EO and IR photos separate into 2 columns.
STARTING THE PROCESS

Left click on Chunk and Add Group. Rename group to EO, repeat for IR then select all EO images and drop in EO Group, repeat for IR.
CAMERA CALIBRATION

Click Tools and select Camera Calibration. Make sure the boxes under Frame match what is shown in the picture below. Note Duo Pro R is highlighted.
CAMERA CALIBRATION

Make sure the boxes under Frame match what is shown in the picture below. Note that the other set of images is highlighted (13mm).
Click Workflow Tab and select Align Photos. Match settings below and click OK.

This will take a bit to run. This example with a Photogrammetry laptop took 14 minutes and 38 seconds.
After Alignment is completed click on Chunk and look at Cameras to make sure that all are aligned. This will match with all the blue dots are now little panes in the Model Pane. Note this slide shows Cameras (388/388 aligned)
IF a few images do not align run again with all 3 top boxes unchecked
Save. Then right click on Chunk and Duplicate. Set the Copy to Active.
The Alignment created the Sparse point cloud as shown to the right.
Click the Model tab and select Gradual Selection. In the dialog box drop down select Reconstruction Uncertainty. Slide the rule to the right and observe the points being highlighted. Move slider until the points that need removed are highlighted.
Click OK on Gradual Selection. Then click the X in the menu bar above model. The highlighted points will disappear.
Click the Optimize Star, circled to the left.

Match the checkboxes as shown and Click OK.
In Workspace Pane highlight the IR Group. Right click and Disable Cameras. Disabled will appear as below.
Select View Error as shown in RED circle and scroll to bottom. View Total Error row. IF the box is checked the location values for that image are true, if not MS ignores those values. Sort by clicking the Error(m) column. Uncheck boxes for up to $\frac{2}{3}$ of the photos. Optimize again. Uncheck more up to $\frac{3}{4}$ of the checkboxes. Optimize a last time.

Note the reduction in Error
Click the Resize Region dropdown and select Resize Region. Click and hold blue dot to drag and place box on the area that is to be modeled. In general bring the horizontal boundaries just inside of the ragged edge, make sure the vertical boundaries are well above and below the model.
Click Workflow and select Build Dense Cloud. Use settings below. This will take some time to process. This example with a photogrammetry laptop took 6 minutes 22 seconds.
Click the Dense Cloud button to view the Dense Cloud. Note there is a lot more detail now in the model.
Click Workflow and select Build DEM. Use settings shown. Click OK.
Double click on DEM in Workspace Pane to view. DEM will open a tab contained in the Model pane. When finished click the X of the Tab labeled Ortho.
Save.
Duplicate the Copy of Chunk 1 only bringing over the DEM and rename EO Chunk.
Duplicate again with only the DEM and rename IR Chunk.
Set EO Chunk as Active. Click Workflow and select Build Orthomosaic. Use settings shown. Click OK.
Double click on Orthomosaic in Workspace Pane to view. You can zoom in/out and drag around.

Ortho may be exported at this point if the shape is appropriate.
Click the Polygon arrow and select Draw Polygon. Click and draw around the fire with a buffer outside of the line. Left click the pointer on the polyline. Select Set Boundary Type and Outer Boundary.
REFINING THE ORTHOMOSAIC

Right click the pointer on the polyline. Select Set Boundary Type and Outer Boundary. Note the line will appear as pictured. Export Shape to import on the IR ortho

Ortho is ready for Export.
IR ORTHOMOSAIC

Set IR Chunk Active and repeat building an Ortho. The ortho will be black to the eye until opened in Arc. The temperature data is embedded in each pixel.
IF needed Import the shape from the EO ortho. This allows exportation of the desired shape.
Right click > Set Boundary Type > Outer Boundary
SAVE AND EXPORT

Save and prepare for exports.

Export:
EO Ortho
IR Ortho
Report
This generates a report for the entire process of Photoscan. It will be important to have as Metadata as well as tell you a lot about your model.

To export, Click File > Export > Generate Report...

Fill the dialog boxes as appropriate and save
Click File > Export > Export Orthomosaic > Export JPG/TIFF/PNG

Match ALL of the settings to the right then click Export and save as TIFF file in next popup.
Only export if needed, a BAER team may request

Click File > Export > Export DEM, Export TIFF/BIL/XYZ

Match ALL of the settings to the right. Click Export and save as TIFF file in next popup.
This concludes processing of fire imagery. You should be able to do basic processing and produce simple products. The exports can now be brought into Arc and developed into usable data.
Note that Metashape will always export a square or rectangle.
Left click layer and properties. Under symbology tab check the box for Display Background Value. Click Apply and OK.
Now the new imagery is overlaid on the Basemap.
REVIEW

• Students have seen the workflow for processing photos
• Students understand how to sort photos
• Students can convert thermal images for viewing
• Students can setup Metashape and process images
• Students can export products from Metashape