**IR FIRE MISSION STEPS GUIDE**

**Pre-flight Planning – 1530 Mountain Time daily**:

* All flight requests have to be submitted by 3:30p M.T. daily on the day they are to be completed. Those requests submitted between 3:30p M.T. and midnight may not get filled, based on crew workload.
* Pilots, IR Techs, National IR coordinator (Tom Mellin), and NICC determine which requests get filled, which requests get bumped, and in what order based on national priorities.
* Determine number of passes and direction needed (N-S, or E-W) to ensure total coverage of mission box(s). East-West **flight lines should be approximately 4 to 5 min apart and starting 2-2.5 min in from the box edge, and North-South flight lines should be approximately 5 min apart and 2.5 min in from the box edge for scan altitudes of 10,000AGL. NOTE:** Flight lines should cross perpendicular to ridges when practical to ensure good scan coverage and reduce lacing on down slope faces.
* Requests can be added or modified until 1530 Mountain Time. If you start planning before 1530 verify no changes have occurred since you downloaded the mission boxes.
* Provide scan lines to pilots, they will return a flight plan. It may be necessary to combine scan lines of mission boxes that are close together to improve efficiency.

**1.** Login to NIROPS website ( <https://fsapps.nwcg.gov/nirops/users/login> ) Account password required.**2.** Assign plane in NIROPS to your assigned fire mission(s).

 a. **Click Current Orders 🡪 Options (on row with desired incident name) 🡪 Assign to Plane, or pick checkbox for mission(s) in list 🡪 Assign to Plane.3.** Get copies (hardcopy or pdf file v.2, etc.) of mission requests being flown by your aircraft.

a. **Click Current Orders** 🡪**check boxes for assigned fires** 🡪 **OUTPUT Pdf v.2 icon** 🡪 **save or print file.**

b. It is recommended you use the iPad and save the file in the GoodNotes mark-up app.

**4.** Determine positions of flight scan lines and annotate on pdf v.2 hardcopy or GoodNotes. Then send to pilots just before the 1530 planning meeting. Use chart for scanline coverage (spacing) Vs altitude above ground. See p.34 in <https://fsapps.nwcg.gov/nirops/docs/upload/NIROPS_Ops_Guide_2010.pdf> .

**5.** Tweet message: **“<fire name> @ ####, <fire name> @ ####, <fire name> @ ####, ….”** From your assigned aircraft account. See References at the end of this document for account login info.

**6.** Login to Twitter account for your aircraft (nirops\_N144Z or nirops\_N149Z) and Tweet message; **Dep: Mesa@2330, 1st fire, 2nd fire, ... RON ABQ about 0100.**  Takeoff time, order of scan missions, and landing place.

**7.** On NIROPS website pick **Tools 🡪 XML Flight Data** – to download flight requests to root directory of USB Flash drive.

NOTE: The filename is "flightdata.xml", do NOT change it. (If this filename exists on USB Flash drive at time of copying of current xml windoze will automatically rename the new xml file with a (1) suffix. The old file and the (1) suffix will have to be removed, and in that order. Please download this file sometime after 1530 Mountain Time but before departing hotel.

1. By default, all mission boxes are included.
2. If you only wish to have your “assigned” fires included in this file then, after all missions have been assigned in NIROPS your aircraft can be selected under the label “Xml flight data for aircraft:” in the upper right of the screen. This will give you a “flightdata.xml” file of just the missions which have been assigned to your aircraft.

**Starting Flight Operations:**

1. Stow gear as directed by pilots.
2. Fill LN2 (liquid nitrogen ~2 cups) into container in scanner box. **Caution: Do Not Operate without LN2!**
	1. Remove insulator blanket and lid on N144Z (clips on front and aft sides – push release button before pulling on clips).
	2. Pull back center isle carpet and remove lid by ¼ turning 4 each Dzus fasteners on N149Z.
	3. Retrieve funnel and Styrofoam cups from drawer below computer in system rack.
	4. Fill one full Styrofoam cup with LN2 and begin filling dewar via funnel.
	5. Wait for “burp” (looks like small volcano, keep watching as one can miss the burp).
	6. Pour 2nd cup until dewar is full and LN2 starts to overflow (pour remainder back in tank)
	7. Return funnel and empty cup to drawer (handle funnel by Styrofoam or funnel edge as it is very cold)
	8. Secure drawer latch. It may hit you in the shin upon takeoff if not secured.
	9. Re-secure LN2 tank with strap over tank in carrier behind seat
	10. Replace lid over scanner well and ensure clips, lock buttons, and or Dzus fasteners are latched and secure
	11. Replace insulator blanket or center isle carpet.
3. After captain (left seat pilot) signals to do so, remove plane’s chocks and stow in front of scanner well (jet N144Z) or cargo area of King Air N149Z, and or push airport chocks out of way from front of wheels. Double-check gas caps are in place & latched, and that outside storage compartments are locked.
4. Close main cabin door.
	1. Check for 4 green safety spots in corners of cabin door and ensure green flags are visible and aligned at door center. May need flashlight (jet), OR 6 Orange lines and red cam (King Air).
	2. Loudly notify pilots, “**Main cabin door is secure**.”.
	3. Check that pin has been removed for emergency door (jet), or key unlocked and removed (King Air).
5. Check for presence of green flight bag in front of scanner well, or near pilots.
6. Fill out IR Tech Mission Log with info for mission names, departing airport, landing airport and time in flight.

**Date:**

**Left Seat**: (pilot name in left seat)

**Right Seat**: (pilot name in right seat)

**IR Tech**: <your name>

**Airport**: K### (use <http://airnav.com> to look up airport abbreviations)

**Time**: #### (2345 Hrs, wheels up and landing time of day)

**Mission Name**: <fire name>

**FS Charge Code**: <P-code> (NOT Necessary)

**BLM Charge Code**: <forest override code> (NOT Necessary)

**Interpreter**: <IRIN interpreter on fire> (NOT Necessary)

1. Pilots start aircraft, then turn on tech power to the Phoenix scanning system. \*If they forget and both engines are running, ask them for power. Applanix Nav Unit line of lights will come on and begin blinking at operator console.
2. Push “Motor Off” button to "Motor On" on the operator console.
3. Push “AC Off” button to "AC On" (May also have to push in 4 round circuit breaker switches.)
4. Insert USB Flash drive with the Flightdata.xml file into the computer at operator console before starting computer. (Helps ensure that USB Flash drive is seen as F:\)
5. Push Computer “On” switch
6. Activate mouse (USB Bluetooth mouse is OK if desired)
7. Open display/keyboard console taking care not to rub aircraft interior when lifting to expose display
8. Ensure computer sees USB Flash drive as “**F:\**” drive. (Any other drive letter will NOT work.)
9. Start Phoenix software. (Looks like NIFC logo bottom left near the Windows orb bottom left of screen.)
10. Delete previous missions:
	1. **System 🡪 Delete Missions 🡪 OK**
	2. Can only delete up to 24 missions at a time, but can delete multiple times if needed
11. Identify technicians working current shift
	1. **System 🡪Tech Set 🡪 Select appropriate names or type new name** (i.e. Kaz/Jill)
12. Import missions requests from Flightdata.xml file on Flash drive
	1. **System 🡪 Import Mission Plan XML**
13. **System** 🡪**Initialize FOO….**
14. Click "Play" icon. **Ensure that software is up and running normal BEFORE leaving ground.** There is no reason to fly if Phoenix is not working. Normal operation is indicated by presence of Green Map, steady LPS(lines per second) value , and A to D within range. These factors are outlined in the steps below.

a. Set the 1st mission for this flight

 **Mission 🡪 Set 🡪 select <fire name\_b#> 🡪Push “Load Selection” button 🡪Push "OK"**

 Selected fire name should be chosen and will be highlighted blue before clicking "Load Selection".

b. A green map will appear in the lower left-hand corner of screen, if not, it may eventually be necessary to restart the Applanix unit. Turn off the Applanix for a 10-count then turn power back on. Usually the Applanix will work after 2-5 min, but it may take as long as 10 min.

 Applanix lights show the NAV unit status. [System, LAN, & IMU (Inertial Measurement Unit-gyro) lights are green and GPS light is orange, restart if necessary and or have pilots taxi away from tall building(s)].

c. Set threshold to about 30 counts above the signal level displayed in graph (you may have to zoom out to show current signal level).

d. Set "Width" to .7(dot 7).

e. Click "Auto Center" (grayscale will be centered on current signal range).

f. Show A to D info

**Click on Waterfall display window🡪 select Brt(upper right) icon 🡪 observe values**

* LPS (lines per second) numbers will be ~195 and changing by no more than 0.1 - 0.2. If changing more than that, there is a problem (no **LN2**, DC Power, 4 circuit breakers not pushed in, or frost or dew on mirrors after landing)
* Channel A value should be about -7200 (If < -7999 there is a problem. Check DC power and or circuit breakers, or LN2.)
* Channel B value should be about -5300 (If < -7000 there is a problem. Check DC power and or circuit breakers, or LN2.)

20. Buckle up and prepare for taxi and takeoff.

21. Record wheels up time in Mission Log

22. Start Firefox software after clearing 10,000 feet above the ground. If you have an iPad or tablet connect to aircraft WiFi and run browser on it to conserve Phoenix memory.

1. Tweet message: **“<tail #> departing <airport>” and ETA to next fire as appropriate**

**Scanning a Fire:**

1. Set up for next mission
	1. **Mission 🡪 Set 🡪 select <fire name\_b#> 🡪Push “Load Selection” button 🡪Push "OK"**
* Ensure <fire name> appears in proper case (144Z uses uppercase; 149Z uses camel case or mixed case)
* Ensure tail number has capital letters (i.e. N144Z)
* Ensure that mission box boundaries are correct (i.e. Lat and longs of scan box). If a latitude or longitude value was edited it will be necessary to select “**get elevation data from DEMS**” button.
* A mission box can be edited or entered manually. After manually entering a scan box don't forget to click “get elevation data from DEMS” button before clicking "OK".
* Record Ground Elevation on pdf request form for future reference.
1. Pilots will open scanner doors 5 to 10 miles prior to edge of scan box. (They may have to be reminded.)
2. Setting up for a scan run;
	1. After the door is open and on level approach to mission box, and on the upper left-hand window;
		1. Click "Auto Center"
		2. Set width to fill about 75% of 0-255 range on horizontal graph
		3. Reset curve, then after 5-30 seconds click clear then auto, and lock curve.
		4. Raise threshold if necessary to not falsely fire trip. Set Fire Threshold 20-40 counts above signal level.
		5. Activate (click) right hand waterfall scrolling screen window
		6. To view A to D info and lines per second (LPS) click "Brt" button which is just above the top of the waterfall scrolling screen window.
		7. B Max preset value should be set to about 400 to 450.
		8. B Min preset value should be set to about 5 to 20.
3. For each run fine tune threshold setting after established on line and before fire.
	1. With no fire in scene, set Fire Threshold 20-40 above signal level in graph. When fire is reached, observe a mix of red & black (i.e. no more than 20% of fire area is black and the scene is not solid red across). Varies with fire conditions.
4. Recording:
	1. As scan coverage tracks on map reach scan box, and **2 min outside** of box edge, push ”**Run”**
	2. Ensure calculated V/H is >=4, number in (#) is calculated, the number to the left of (#) is set to 4 currently, flight is too fast for scan to work properly if the calculated is less than the value currently set. Ask pilots to slow as needed to achieve a value of 4 or greater in the parentheses. The startup default for V/H is 5, please decrease to 4.
	3. Notify pilots “**Rolling** (Starting run**)**”. Be communicative with the pilot and direct.
	4. Monitor signal to threshold and image grayscale, adjusting "Center" (grayscale) and "Threshold" only as needed. Maintain the Threshold level 20-40 above signal level and a visually pleasing grayscale of the image in the waterfall display.
	5. As plane marks extend outside of scan box and no fire has been detected for 10 seconds, push “**Stop**”. Notify pilots “**END OF RUN**”, if planning to end run, or "**Hold line we still have fire**" if still detecting fire. If fire pushes off the side of a run additional run(s) will be required to capture the entire fire perimeter in the images.
	6. System will automatically start to process data, ftp and send Tweet. (Progress bar lower left of screen) Files rectify, FreeArc compresses files, Data uploads to ftp site (/nirops/Fires2016/…) Data files are stored under C:\PhoenixData\ . See Appendix #??, for more information about file management.
	7. When processing of a scan line completes the compressed file is coppied to F:\ (USB Flash drive) & original files are moved to the backup disk D:\ on computer.
	8. After the last run for a mission box is completed and after the file is processed (script in DOS window will start)
		1. Click **“blue antenna button” 🡪 click Transfer Selections 🡪** files will be compressed and amended with “FIN” suffix and copied to F:\ and original files will be moved to D:\ backup. Only one mission box can be finalized at a time. This process will have to be repeated for each mission in the list if more than one exists. Only the mission at the top of the list will be processed each time this procedure is exercised. This process must be exercised to complete/finalize each mission box. There are times when a technician has to start another mission right away and before the final file is processed. This is one way more than one mission name can show in this list.
	9. On NIROPS website "Current Orders", set Options to Mission Complete
		1. **Click Current Orders 🡪Select fire name 🡪 Options 🡪 Mission Complete**
	10. Prepare for next mission box (repeat steps Scanning a Fire 1 thru 5.for each mission)
	11. When time permits "Review scan images (color and ortho .tif, and mosaic files) on the C:\Phoenix Data\ or D:\ backup to examine quality".
	12. Files names that do not automatically complete the ftp transfer will have the prefix “uploading\_”. These files will be located in C:\Uploads\ and also on the F:\ flash drive. A copy of all self-extracting compressed files that were or should be sent ftp, will be on the flash drive.

6. Additional actions

1. Transfer any additional files to interpreters as requested and as time permits by adding it to the file package or by manually using FreeArc and FileZilla
	* 1. Ortho.tif – posted to ftp automatically
		2. Color.tif - posted to ftp automatically
		3. Raw.tif – collected but NOT posted to ftp automatically (by request only as time permits)
		4. Fire.tif - collected but NOT posted to ftp automatically (by request only as time permits)
2. Tweet to notify IRINs when the ftp transfer is complete.

7. Tweet to notify of planes status. ie ETA to next fire, ETA to fuel stop, or RON

* **“Enroute to <fire name>”; “Fuel stop @ <airport> abbreviation”,** etc.

**Landing Flight Operations:**

1. Tweet message: **“<*tail #*> arriving <*airport*> for fuel stop or RON**” (RON = Remain OverNight)
2. Record in Mission Logbook
	1. **Airport**: K### (use <http://airnav.com> to look up airport abbreviations)
	2. **Time:** #### (2345 Hrs, use same time zone you departed from)
	3. **Calculate hour totals** (if done for night)
3. Clean up files (if done for night) and close down all programs.
4. Safely remove USB Flash drive (USB Drive F:\)
5. Shutdown Computer
6. Turn off mouse
7. “Motor” button to off AFTER wheels have touched down
8. “AC or DC” button switch off
9. Remove USB Flash drive in console (if done for night). NOTE: If leaving USB Flash drive in console, be careful not to snag it.
10. Move luggage forward before lights go out and after taxiing.
11. If tomorrows temperatures are expected to be high when closing up plane for evening, close window blinds to help minimize heat in plane.
12. When pilots give ok, or the engines have wound down, then open doors and put down stairs.
13. Ensure wheels are chocked and notify pilots that this has been accomplished.
14. Apply covers and pillows to engines. Apply covers to pitot tubes (caution they are HOT and cool slowly). Disconnect battery in jet N144Z (1/4 turn counter-clockwise) after cleared to do so from the Captain.
15. Assist in removing and loading luggage in rental car.

16. Lock Plane compartments and door. (Pin (Jet) or Key (KingAir) should be in emergency escape door)

**TROUBLE SHOOTING:**

* Plane turns >27o throw off signal reference levels. Don’t try to re-set or fine-tune settings during plane turns.
* Erratic LPS values (displayed by clicking "Brt" icon at top of waterfall display) in flight may indicate need for LN2 in scanner box or frost/dew on mirrors.
* A full dewar of LN2 should last for 8 hours at 70deg F. During hot periods and long nights it may become necessary to add 1/2 to 1 cup of LN2 before taking off for the last flight leg of the night. If it does become necessary to add LN2 notify Kaz or Woody the next day.
* If V/H Override number in (#) is < 4, flight is too fast for current altitude to work properly, ask pilots to slow as necessary to achieve working V/H value.
* Report any anomalies to Woody or Kaz immediately if help is needed or the next day.

References:

* Wi-Fi Passwords
	+ 144Z – fearlessink924
	+ 149Z - unevenflamingo189
* Twitter Passwords
	+ User: NIROPS\_N144Z, Password: Ph@enix1
	+ User: NIROPS\_N149Z, Password: Ph@enix1
* URLs
	+ <http://airnav.com>
	+ <https://fsapps.nwcg.gov/nirops/users/login>
	+ <http://flightaware.com/>
	+ <http://www8.nau.edu/cvm/latlongdist.html>
* Identifiers
	+ Citation jet:
		- tail #: **N144Z**,
		- flightaware.com id: **XCN44**,
		- ATC call-sign: **Firescan44**
	+ King Air: tail #:
		- tail #: **N149Z**,
		- flightaware.com id: **XCN49**,
		- ATC call sign: **Firescan 49**

**A**ppendix – File Management

C:/PhoenixData

* Contains the following files until FINal is excuted:
* raw (.tif) - recorded image in original format
* collected image file (.tif)
* log (.plf)
* orthorectified black & white (.tif)
* orthorectified color (.tif)
* 3 raw heat shape files (.shp, .dbf, .shx)
* If above files remain in C:/PhoenixData after mission processing complete, an error has occurred. Manually move files to D:\N144Z\_Backup\_Data\ or D:\N144Z\_2015\_BACKUP\_DATA\. No files should remain in C:/PhoenixData if processing occurred correctly.
* Delete "...passes" files after mission finished and next mission is SET

C:/Uploads

* contains the following files:
* FreeArc self-extracting executible (.exe) of orthrectified b&w.tif and color.tif -
* while uploading to ftp, files will have prefix of "uploading"
* when upload to ftp is complete, file will be renamed removing the "uploading" prefix
* Clean out any leftover files from yesterday. Residual files may remain if any of the processing was interrupted.

FTP Site

ftps://ftp.nifc.gov/nirops/2019\_Fires, Encription = TLS/SSL Explicit encryption, Port = 1021

* self-extracting executible (.exe) of orthrectified b&w.tif and color.tif
* <yymmdd\_2400time\_firename\_b#FIN.exe> = mosaic.jpg, RawHeat shape files, meta.html

D:\2019\_N144Z\_Backups\ or D:\2019\_N144Z\_BACKUPS\

* contains the following files:
* raw (.tif) - recorded image in original format
* collected image file (.tif)
* log (.plf)
* orthorectified black & white (.tif)
* orthorectified color (.tif)
* 3 raw heat shape files (.shp, .dbf, .shx)

F:\

* contains the following files:
* FreeArc self-extracting executable (.exe) of orthrectified b&w.tif and color.tif
* while uploading to ftp, files will have prefix of "uploading\_"
* when upload to ftp is complete, file will be renamed removing the "uploading"
* Files in C:\Uploads will also be copied to F:\

**Cautions**

Some Phoenix computers have locking removable hard drives and some appear to be removable but are hard wired. Do not remove Hard Drives from computer HD bays.

Special Thanks to Jill Kuenzi for all the work on the initial framework of this document.