

Summary Flight Procedure: Matrix

UAS

1. Turn on RC Transmitter
2. Ensure proper UAS model is selected
3. TX switches forward (if applicable)
4. TX throttle down
5. Plug in battery to UAS
6. Check roll, pitch, yaw response to movement on Mission Planner
7. Check mode change switch if applicable (loiter, stabilize, auto, etc..)

Camera

9. Install battery in Camera
10. Install SD card in Camera
11. Turn on Camera
12. Photograph GPS time on Mission Planner display
13. Set manual focus against target to >40m
14. Set white balance with the gray card
15. Check Battery Level
16. Check SD card Capacity
17. Mount Camera on Gimbal
18. Clean lens

Gimbal

19. Check Gimbal Balance; check for neutral
20. Plug in Gimbal Battery (if applicable) WAIT 10 seconds

Video

21. Turn on real time feed monitor
22. Plug in video TX and RX
23. Test video Signal
24. Change camera to intervalometer mode
25. Check home position for UAS on Mission Planner.
26. Upload or set up Mission (though this should be done before this point!)
27. Check Mission has upload correctly.
28. Monitor GPS lock until **PDOP is <2.0 meters**

Pre Takeoff

29. Check area for flight hazards, low flying aircraft
30. Ensure personnel are clear of takeoff area and flight path

On the UAS

31. Put UAS in 'loiter mode'
32. Push Pre-Arm button (Matrix, IRIS, Solo)
33. Arm the autopilot from the Transmitter
34. Take off
35. Rise to Mission altitude
36. Switch to 'auto' mode

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Initial set up

1. Mount batteries
2. Check that the CG is centered, or *very slightly* shifted toward nose (nose-heavy)

Batteries

3. Install “screamers” on batteries
4. Install GoPro Cameras
5. Plug IMU into computer (white USB connector)
6. Plug Lidar into computer (black Ethernet connector)
7. Check: USB drive plugged into **upper right** USB slot
8. TX switches forward
9. TX throttle all the way down
10. TX aileron centered
11. Turn on **transmitter (NOT craft!)**
12. Check model: TX is “Heavy Lift Helicopter”
13. Throttle hold ‘on’ (“SG switch should be **up, toward you**)

Power plug in Sequence

14. Ensure throttle hold is **on**
15. Top right battery (1) to plug into input with flight controller power lead (1)
16. WAIT TEN SECONDS for IMU gyros to stabilize
17. Top left battery (2) into input at bottom left *Listen for arming tone from ESC*
18. WAIT ANOTHER TEN SECONDS for IMU gyros
19. **Arming tone should produce 12 tones, corresponding to a 12 cell battery**
20. *Unusual tone: ESC log is full. Download and start over*
21. Connect final two batteries.

Transmitter input check

22. Check throttle hold is **on**
23. Right stick (elevator) forward: check that swash tilts forward

24. Right stick (elevator backward: check that swash tilts backward
25. Right stick to right (aileron): check that swash tilts right
26. Left stick to right (aileron): check that swash tilts left
27. Again **check that throttle hold is on**
28. Left stick (throttle/pitch) up: check that swash plate move **up** shaft
29. Return left stick to lowest position
30. Left stick (yaw) left: check that tail blades are blowing air to **left side** of aircraft
31. Left stick (yaw) right: check that tail blades are blowing air to **right side** of aircraft

Gyro Check

32. Check that throttle hold is still **on**
33. Tilt nose down: swash should tilt **back** to compensate
34. Tilt nose up: swash should tilt **forward** to compensate
35. Tilt craft left: swash should tilt **right**
36. Tilt craft right: swash should tilt **left**
37. Pull craft toward you: air should *hypothetically* blow toward you to oppose the pull
38. Push away from you: air should *hypothetically* blow away from you to oppose push

Auto Pilot Check

39. Throttle **down** and throttle hold still **on**
40. Start with switch fully forward
41. Full forward to GPS: two green lights should be flashing on GPS antenna
42. Switch to center position: two purple flashes should be seen on GPS antenna
43. Switch to full manual mode: no lights should be flashing on the GPS antenna
44. Return to full forward (GPS mode): 2 green flashing lights again

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45. IMPORTANT: if lights flash **red**. This is a NO GO for flight

46. All switches forward EXCEPT THROTTLE HOLD

47. Throttle position still fully back

48. Toggle switch F (rate mode switch) from forward to back, then to forward again
-this centers the tail rotor for takeoff

position

Payload Start up

49. Turn on Cameras

50. Plug in payload battery: check to make sure Lidar is spinning

51. Throttle hold forward. Throttle hold **off**.

52. Increase throttle/pitch to 2nd position ind. Bar

-this initiates ESC governor; ramps up

RPM to operating speed

53. Wait for ESC to spool up to RPM

Take off

54. Increase throttle/pitch to stick just above 5th position

55. Climb to altitude. Reduce throttle to just below 4th position to **hover**

Ground station transfer

56. Click '**go**' on pre-planned mission

57. Toggle Mode Switch (TSE) forward and back to set to GPS cruise

Landing

58. Return to hover in GPS mode over landing location

59. Decrease throttle to just below 4th position to initiate **slow** descent

NEVER LOWER BELOW 3RD POSITION DURING LANDING

When skids touch ground

60. Lower throttle to 3rd indicator position

61. Switch throttle hold indicator backward (hold **on**)

62. Look for (red-blue-flash white) GPS light indicator

63. WAIT 8-10 seconds for throttle to turn off

64. Put throttle position at its lowest indicator position

