1. Quadplane in hovering mode

Switch in manual mode, target altitude at 150cm, throttle stick at zero,

* 1. Telemetry

*Build with TestGains and disableEmergencyLanding flags activated (means that we are in stabilized mode)*

Using throttle stick, check that telemetry throttle output reacts correctly in real time

* 1. Motor control

*Build with TestGains and disableEmergencyLanding flags activated (means that we are in stabilized mode)*

Set throttle stick at around ¼. Then using the roll and pitch stick, check the motor response :

* Roll order to the right : right motors should slow down, left motors should accelerate
* Forward pitch order : front engines should slow down, rear engines should accelerate
  1. Altitude control

*Build with TestGains,TestAltitude and disableEmergencyLanding flags activated (means that we are in stabilized mode)*

* + 1. Check control of target altitude

Using telemetry, check that the Tx right potentiometer correctly commands the target altitude. Check that the expected minimum and maximum target altitudes are obtained

* + 1. Apply the take-off procedure until stabilized altitude control is engaged. Then verify that :

1. When plane altitude is equal to target altitude, the throttle should be

throttle\_offset throttle\_offset = 2\*SERVORANGE\*AircraftMass / (100 \* MaxThrust)

For AircraftMass = 1250g ; MaxThrust = 40N ; throttle = 625

1. Modify the target altitude to obtain target\_altitude – plane\_altitude = 50cm. Then check that throttle = throttle\_offset + 2 \* AircraftMass / (100 \* MaxThrust) \* zkp \* vzkp \* acczkp \* 50

For zkp = 9 ; vzkp = 4.8 ; acczkp = 0.6, then throttle = throttle\_offset + 810 = 1635

* + 1. Lidar failure

Check that sonar altitude is close to lidar altitude.

Mask the lidar with your hand. Check that the altitude is now determined by the sonar and that the altitude and the throttle behave smoothly during the transition.

* 1. Functional test

*Build with the TestGains and disableEmergencyLanding flag*

* + 1. Engine safe initialization

In manual mode :

check that engines are off when throttle stick is at zero

set throttle stick to a value greater than 20%. Check that roll and pitch stabilization works as described in section 1.2

check that flight phase is take-off

* + 1. Standard flight in manual mode

In manual mode, take-off and check that the in-flight mode activates above 1m.

Then, reduce altitude to return below 1m. Check that it remains in in-flight mode.

Reduce throttle below 20%. Check that it immediatetly switches to take-off mode.

* + 1. Standard flight in stabilized mode

Switch to stabilized mode :

Check that engines run at 20%

Move uav at a height of 1.5m. Check that reliable altitude measurement switches to 1. Check that flight phase switches from take-off to in-flight.

Move uav to a height smaller than 80cm. Check that flight phase switches from in-flight to auto-and. Check that the engines slow down until they stop. Check that flight phase switches from auto-land to take-off.

* + 1. Manual override

Test 1 :

Switch to stabilized mode :

Check that engines run at 20%

Switch to manual mode. Check that the engines respond to throttle stick

Test 2 :

Switch to stabilized mode :

Move uav at a height of 1.5m. Check that reliable altitude measurement switches to 1. Check that flight phase switches from take-off to in-flight.

Switch to manual mode. Check that the engines respond to throttle stick

Test 3 :

Switch to stabilized mode :

Move uav at a height of 1.5m. Then move uav to a height smaller than 80cm. Check that flight phase has switched to auto-land. Switch to manual mode. Check that flight mode switches to in-flight and that the engines respond to throttle stick

* + 1. Stabilized mode after manual override

Switch to stabilized mode :  
Move uav at a height of 1.5m. Check that flight phase switches from take-off to in-flight.  
Switch to manual mode.  
Then switch to stabilized mode. Check that integral terms in altitude control PIDs have been resetted to zero.

* 1. Emergency landing

*Build only with the testEmergencyLanding flag*

testEmergencyLanding sets max altitude to 1.7m

Either manual, stabilized or GPS mode is engaged, the failsafe mode should be activated in the following cases :

|  |  |  |  |
| --- | --- | --- | --- |
|  | Low battery | Radio off | Max altitude exceeded |
| Test 1 | 1 | 0 | 0 |
| Test 2 | 0 | 1 | 0 |
| Test 3 | 1 | 1 | 0 |
| Test 4 | 0 | 0 | 1 |

* 1. Altitude sensor failure

*Build with the TestGains and disableEmergencyLanding flag*

* 1. GPS mode

*Build with the TestGains, disableEmergencyLanding and testGPSPositioning flags*