Module 3 Mission Planning AM Brief

1. Objective

Design an autonomous mission that completes an aerial survey of the Chrysalis Academy school site, to the east of the M42 Metropolitan route and north of Tokai Rd. Table Mountain National Park lies to the west, and an access road runs along the north side.

Task Overview:

- Take off automatically to a safe altitude.
- Fly a defined survey/search pattern over the designated area.
- Trigger a simulated action (e.g., DO_SET_SERVO or camera trigger command) at two specified waypoints.
- Return to launch and land automatically.

2. Mission Area & Constraints

Home / Launch Reference Point

- Latitude: -34.05657497
- Longitude: 18.419823641
- Altitude: 53.34 m ASL
- Maximum altitude: [INSERT VALUE, e.g., 60 m AGL]
- Minimum altitude: [INSERT VALUE, e.g., 15 m AGL]
- Maximum mission duration: [INSERT TIME LIMIT]

Site Boundary (8-point polygon)

WP	Latitude	Longitude
1	-34.0575482	18.4195554
2	-34.0572816	18.4183431
3	-34.0553706	18.4180219
4	-34.0549883	18.4199525
5	-34.0539928	18.4201884
6	-34.0528372	18.4256172
7	-34.0534772	18.4265828
8	-34.0547217	18.4251451

Enclosed area: approx. 19.0 hectares (0.19 km²)
Perimeter: approx. 2,053 m

Flight Constraints

In addition to the general safety requirements, you must design and fly a mission that satisfies the following hard constraints. These are to be treated as mission critical.

1. No overflight of buildings

- The flight path (including turns and grid transit legs, not just camera trigger points) must not pass directly over any building footprint on the school site or surrounding property.

- You must identify all building footprints within the study area from the provided imagery and mark them as exclusion zones before generating the survey grid.

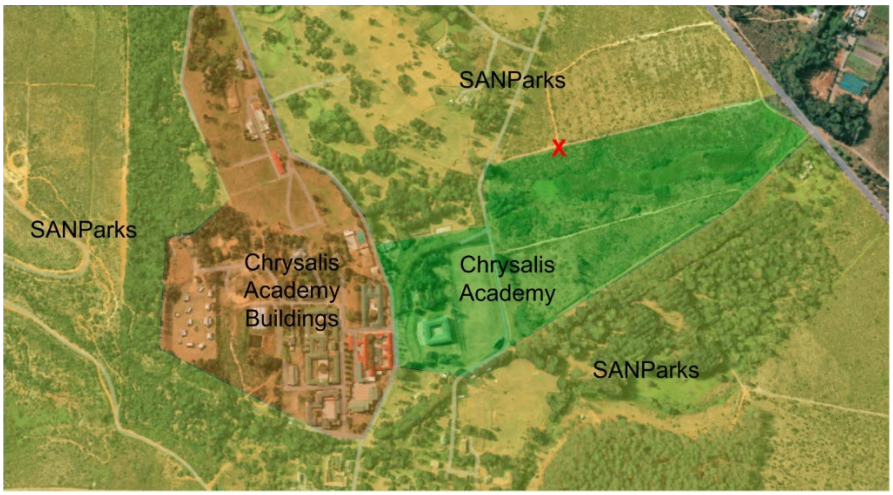
- Where a building interrupts a planned grid line, students must either reroute that line around the building footprint or split the grid into sub-blocks that avoid it and justify any resulting gap in image coverage.

- This applies regardless of altitude — a building lying directly beneath the flight path is a violation even at 130 m.

2. 30 m standoff from wildlife

- A family (troop) of Cape baboons is known to range in and around the study area, given its position on the Table Mountain National Park boundary. The current location of this troop is:

Red X shows baboons.



Baboons at:
Lat: -34,0536417
Long: 18,4214759

- No part of the flight path may come within 30 m (horizontal distance) of the provided troop location at any time.

- You must treat the provided coordinate as the center of a 30 m circular buffer and always route the flight path outside that buffer.

- If the buffer overlaps the survey polygon significantly, you must either accept a coverage gap in that region or propose a revised flight altitude/timing that still satisfies the standoff (note: standoff is a horizontal distance requirement, not resolved by flying higher above the buffer).

3. Required Mission Elements

The submitted mission must demonstrate the following in Mission Planner:

- Automatic takeoff (TAKEOFF command)
- A logical, efficient waypoint path that fulfills the mission objective.
- At least one conditional or triggered action relevant to the task (e.g., DO_SET_SERVO, camera trigger, DO_CHANGE_SPEED)
- A configured geofence with a defined breach action.
- Failsafe settings configured for RC loss, GPS loss, and low battery (even though these will not trigger in simulation, they must be set correctly)
- Automatic RTL and/or LAND at the end of the mission

4. Task Steps

1. Explore the study area using the provided imagery and identify all building footprints on and around the site. This is a competitor task — no building locations will be given; they must be read directly off the imagery.
2. Note the provided wildlife location. Use the supplied current coordinate of a resident Cape baboon troop known to range in the study area. This is given, not derived from imagery.
3. Load the Pre-Cache Map data into Mission Planner.
4. Select Takeoff & Landing Site — choose a dedicated, safe on-site location that is away from crowds, free of obstacles, clear of flight-safety hazards, compliant with aerial photography operating requirements, and positioned so RTL/failsafe paths do not cross buildings or the wildlife buffer and is not itself within 30 m of the provided troop location.
5. Define exclusion zones — draw a polygon exclusion zone (or use Mission Planner's Fence tool with an inclusion/exclusion polygon) around every building footprint identified in Step 1, and a 30 m radius circular exclusion zone around the troop location provided in Step 2.
6. Define the survey area and initial parameters — Altitude: 80–130 m; Side overlap: 60%; Camera: Sony A7R (sensor 35.9 × 24.0 mm, 7360 × 4912 px).
7. Camera setup — enter the Sony A7R specifications into Mission Planner's Survey (Grid) camera dialog so GSD and footprint are calculated automatically for the chosen altitude.
8. Generate and adjust the survey grid — run Auto WP → Survey (Grid) over the site polygon, check the generated grid lines against the building and wildlife exclusion zones, manually edit or split any grid line that intersects an exclusion zone, and document any resulting coverage gaps.

9. Determine flight count — calculate whether the site (accounting for exclusion zones and any resulting grid splits) can be covered in one flight or requires multiple flights, based on estimated mission time versus assumed battery endurance.
10. Save the project — save the completed mission (.plan/.waypoints) so it is ready to load at the field site.

5. Deliverables

Each competitor must submit:

- The mission file (.waypoints file exported from Mission Planner)
- A screen recording or set of screenshots showing the mission running successfully in SITL, including the flight path on the map.
- The downloaded SITL log file (.bin or .tlog) from the simulated run