Aerodynamix: Guardian

Marks Distribution and Problem Statement for Avishkar'20

Aero Club, MNNIT

Hello, enthusiasts!

This document (hopefully) will be a comprehensive guide for you to attempt the Guardian problem under Aerodynamix. This event is concerned with the automation of drones on software in the loop simulator and mission planner software.

You can not use mission planner or any GUI based software for planning, it will only be used for visualisation purposes, all planning shall be done by dronekit-python codes.

Below is a breakdown in stages and marking patterns.

STRUCTURE AND MARKING SCHEME:

There are three rounds, all of whose scores count towards the event.
150 marks are split as:

MARKS	DESCRIPTION
40	**Round 1:** Tasks using Single Drone
60	**Round 2:** Swarm Mission Execution
20	**Round 3:** Viva
30	Code Evaluation and efficiency of execution
TOTAL: 150	

Bonuses :

1) If you can connect any simulator like JMAV sim with your scripts and show the maneuvers there, rather than mission planner: (+15) marks

2) A bonus of (+10) marks each in both round 1 and round 2 if all the 3 tasks are done in succession as one single mission i.e. a single code is executed to complete all three tasks. (+5) if 2 tasks are achieved by a single script.

Note:

All the tasks have to be done in MNNIT Athletic ground at any altitude of your choice (drones should not touch ground during the task). If you cross the boundary of athletics ground in any task a penalty of (-5) for that task will be added.

PROBLEM STATEMENT

You are the founder of a budding drone startup, and you have received the contract to provide drone solutions to Indian Army.

However, soon after the tender, Republic Day is coming and you need to help Indian Army set up the drone show.
As the first step, you need to simulate some of the tasks you will be performing in the drone show in front of a committee of army officers, all of whom are very detail-oriented, or you risk losing your contract. However, if your simulations please the officers, a myriad of opportunities await you.

Do you have what it takes to avail them?

ROUND 1: SINGLE DRONE BASED TASKS (40 marks)

Simulate a single drone in mission planner using SITL.

1.1 Complete a hexagon with distance between each point of hexagon being 35-40 meters. The closer the hexagon to a regular polygon, the better.
(MARKS 10)

(NOTE: Above image is just an example and a reference for the starting position/home location in the image. You can change the starting position as per your choice but the hexagon must remain in the bounds of the ground, free reign over altitude, but must be over ground)

1.2 Complete a horizontal 8 figure and a spiral of 3 turns (Smaller spiral will be preferred) with the drone. (**MARKS 10**)

1.3 Complete a vertical circle of approx 5 metre dia, a vertical 8, and a flip (of noticeable size) with the drone. (**MARKS 20**)

Full creative freedom is afforded for this round i.e. the shape and method of completing the 8 figures is up to you, and the most smooth and creative executions will get the highest marks.

Video submission:

You have to make a video for this round, either with screen recording, or using a phone only, but the entire screen should be visible for the entire duration of the run time, else your submission will not be evaluated. The recording should start before you execute your script and should stop only after all the tasks are completed. The entire recording should be done as one recording and no editing should be made before submission.

Note:
It is not mandatory to complete all tasks for evaluation, each task will be graded individually and marks will be allotted accordingly

The tasks may seem daunting at first, but once you will start these, it is going to be great learning and fun.

ROUND 2: SWARM MISSION EXECUTION (60 marks)

This task is concerned with drone swarm i.e. coordinating 2 drones to achieve the tasks.

2.1 Complete horizontal 8 figures and with the drone swarm.
The axis of 8 for both drones should be perpendicular. (**MARKS 10**)

2.2 Complete circles of approx 3 m each diameter with the drone swarm. One drone should execute a horizontal loop and another a vertical loop. (**MARKS 20**)

The drones' coordinates will be individually code and therefore this task depends on the coordination between the drones.

2.3 A swarm of 3 drones should be coded to arrange in the shape of a triangle, a straight line, letter L and letter a straight line perpendicular to line before.
Here you will code the coordinates of one drone explicitly (leader) and others should only know the position of leader and respond accordingly. (**MARKS 30**)

Note: For both round1 and round2 you will get 2 chances each to re-run your code (if mission fails somehow) in live evaluation. You will be given 3 mins to edit your code, if needed. For each such re-run you will be awarded (-15) marks.

Video submission:

You have to make a video for this round, either with screen recording, or using a phone only, but the entire screen should be visible for the entire duration of the run time, else your submission will not be evaluated. The recording should start before you execute your script and should stop only after all the tasks are completed. The entire recording should be done as one recording and no editing should be made before submission.

Note:
It is not mandatory to complete all tasks for evaluation, each task will be graded individually and marks will be allotted accordingly

The tasks may seem daunting at first, but once you will start these, it is going to be great learning and fun.

VIVA (20 marks)

Based on task implementation, your code, drone automation, and other concepts related to drones or used in tasks.

DEADLINES:

Deadline for registration: October 20th, 2020, 23:59:59

Round 1: October 25th, 2020, 23:59:59 {Penalty of (-20) each day after this till 27 October}

Round 2: October 30th, 2020, 23:59:59 {Penalty of (-30) each day after this till 1 November}

Additional Round: Will be carried out in between Avishkar dates only if needed to select the best. It will be similar to Round 1 and Round 2 with some modifications, which will be told on the spot.

Dates for the viva shall be shared later.

VIDEO AND REPORT SUBMISSIONS:

You have to submit a video for each round without time forwarding and well commented codes and a 1-2 page pdf explaining your approach to each task for each round.

Each of the videos that needs to be submitted will first be uploaded on YouTube as an unlisted video (compulsory), and then the links shall be shared with us, before the deadline. There's penalties for not adhering to the deadlines for the submissions.

You will also be required to run your code and share screen, also we can run your codes on our system to test them. Needless to say, any form of cheating will lead to instant disqualification.

We highly encourage you to use the FB page Aeroclub for discussions.

For each task, in each round you have to make a zip file of pdf, codes and link to an unlisted youtube video, and then compress all zip files and a doc containing your team name and team member details into a single zip folder of your team name. Mail this zip folder to aeroclub@mnnit.ac.in with subject "GUARDIAN_SUBMISSION_TeamName" before the deadlines.

RESOURCES:

- Downloading mission planner: https://ardupilot.org/planner/docs/mission-planner-installation.html
- Mission planner documentation:- https://ardupilot.org/planner/docs/mission-planner-overview.html
- Setting up a simulated vehicle: https://dronekit-python.readthedocs.io/en/latest/develop/sitl_setup.html
- Video tutorial for the setting up (most important):- https://www.youtube.com/watch?v=h5vAjbsNUV8

Let's see who can tame their drones, and whose drones just fly around!

QUERIES?

DM any of the coordinators on WhatsApp or Gmail.

Archit Chaudhary: 9521818693
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---------ALL THE BEST!---------