

2018 CPS Challenge

Submitted by [akarns](#) on Wed, 04/12/2017 - 4:03pm

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"No robot left behind!"

TIMPA airfield, 3250 N Reservation Rd, Marana, AZ 85653

The 2018 CPS Challenge took place in May of 2018; the final results are posted below. Stay tuned for the upcoming announcement of the 2019 CPS Challenge.

Embry-Riddle Aeronautical University wins the 2018 CPS Challenge!

Final ranking:

- 1: [Embry-Riddle Aeronautical University \(ERAU\)](#)
- 2: [Halmstad University \(Sweden\)](#)
- 3: [Vanderbilt University](#)
- 4: [University of Pennsylvania](#)

Other awards:

- [Halmstad University](#) for the best UAV design.
- [ERAU](#) for most innovative lost UAV recovery method.

Media:

["Daytona Beach Students Dominate NSF's Autonomous Aerial Vehicles Competition"](#) , The Embry-Riddle Newsroom, June 7, 2018.

["Engineering students in second place in international drone competition"](#) , Halmstad University News, June 7, 2018.

IMAGINE



Your friend's quadrotor went down in a large field, and a storm is coming in. Looking for this lost drone needs a solution that could be repurposed to solve many other problems, like looking for a place to deploy a mosquito sensor.

GOAL

The goal of this challenge is to use a quadrotor aircraft with downward facing camera, and possibly other sensors, to scan an area for a lost aircraft, and recover it safely back to base.

Teams will be provided with powerful [simulation tools](#) on the CPS-VO, as well as support with hardware decisions.

Why participate?

- Develop autonomy for UAV team, in a fun setting.
- Engage in agile design iterations, both for software and hardware.
- Experiment with complex mission scenarios using powerful cloud-based simulation tools.
- Repurpose solution to other problems, such as searching for a strategic location to deploy and recover a sensor probe.

Timeline:

- ~~November 9-16, 2017 - Challenge goal and resources advertised on mailing lists and at NRI and CPS PI meetings.~~
- ~~January 10, 2018 - 10 teams selected to participate in cloud-based OpenUAV simulation trials.~~
- ~~March 3, 2018 - Demonstrate search and recovery in simulation with two or more UAVs.~~
- ~~March 5, 2018 - 6 teams selected for outdoor challenge at TIMPA airfield, Arizona, with one UAV each.~~
- ~~May 15-17, 2018 - Outdoor challenge at TIMPA airfield.~~

Scoring:

- 30/100 points for detection,
- 40/100 points for recovery,
- 20/100 points for release,
- 10/100 points for landing at base.

If robots are under manual control for any portion of the task, team loses 50% of score for that task.

Ideal teams: The challenge is designed for undergraduate teams participating in a one semester course. Teams should have a mentor who is a graduate student, or a faculty member that can provide direction and suggest technical approaches. All solutions will involve both software and hardware.

Software: Teams should plan to use the [Robot Operating System \(ROS\)](#) . Development can be done exclusively with Python, though C++ could be used as well. Sample code for a simple swarm flocking algorithm is available at the project GitHub [repository](#). Potential teams are encouraged to join the project.

Hardware: Any vehicle that supports the [ROS compatible PX4 autopilot stack](#) is suitable for the challenge. The vehicle should have on-board companion computer, and cameras that support ROS integration in order to facilitate algorithm implementation. Project organizers have listed a few compatible off the shelf and custom vehicles below.

- [Intel\(r\) Aero Ready to Fly Drone](#)
- [Erle-Copter](#)
- Custom configuration for [Penn AiR hexrotor](#) (bill of materials)

Legal requirements:

1. Team vehicle must have an FAA registration number. Go to <https://faadronezone.faa.gov/> and register under section 336.
2. The pilot in charge for each team will need to be a member of the Academy of Model Aeronautics (AMA) <http://www.modelaircraft.org/> . The pilot will need to show their membership card at the event.

Hotel information:

Block rates available if booked by **May 1, 2018**.

Holiday Inn Express & Suites Tucson North
8373 N Cracker Barrel
Tucson AZ 85742

Room rate is \$95 plus tax per night
Includes two people (\$10 each for extra people)
Includes free breakfast, parking, and wifi

To reserve you must call the hotel directly 520-572-4777 and say you are with the NSF Student CPS Challenge group.

Other hotel options, within two minutes walking distance of Holiday Inn.

Days Inn & Suites Tucson/Marana - (520) 333-6712

Comfort Inn & Suites - (520) 579-1099

Super 8 Marana/Tucson Area - (520) 572-0300

La Quinta Inn & Suites NW Tucson - (520) 572-4235

Outdoor challenge schedule:

(lunch provided at TIMPA all three days at noon)

Tuesday May 15 (day 1):

0600-1600: Flight tests and system calibration

Wednesday May 16 (day 2):

0600-1200: Scored attempts

1200-1600: Flight tests for teams who have not finished three scored trials

Thursday May 17 (day 3):

0600-1200: Scored attempts

1200-1500: Result tallying

(two-hour buffer time)

1700-2000: Dinner and awards ceremony at

Li'l Abner's Steakhouse

8500 N Silverbell Rd, Tucson, AZ 85743

<http://lilabnerssteakhouse.com/>

Packing list:

We will provide water and electrolytes, lunch, snacks, power cords, power strips, chairs, work tables, soldering iron stations, and miscellaneous tools.

We ask you to keep the following two in mind when packing.

1. Drone specific tools and spares -- because things will break, and disassembly and reassembly might be needed on the field.
2. Desert attire -- hats, shades, boots, and sunscreen. It will be sunny and hot (~85F peak) outside the shade structure. Airy clothes and hiking socks and boots are recommended in the Sonoran Desert.

If you have questions, please contact Jnaneshwar Das at
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