

Sample Handout – *Robots that fly ... and cooperate*

1. **Vocabulary**

Match the following words with their definitions:

English	Definition
___ aerial	1 the total weight that something can lift as it flies
___ autonomous	2 able to move quickly and change position easily
___ unmanned	3 calculate
___ onboard processors	4 computers inside a vehicle
___ sensors	5 equipment that reacts to changes in the outside conditions
___ figure out	6 in the air
___ scaled down	7 independent, able to make its own decisions
___ agile	8 made smaller
___ obstacles	9 manage to control a problem or do something difficult
___ payload-carrying capacity	10 things that get in the way of something
___ overcome	11 together with other vehicles in a fixed pattern
___ in formation	12 with no people to operate something

2. **Lead-in/Orientation**

Work in groups. Discuss what you know about remote control aerial robots, sometimes known as drones. Talk about the following points:

- what they look like
- how they fly
- how they are operated
- how big (or small) they are
- their current applications
- their cost
- any problems associated with them

3. Comprehension

Choose the correct options to make true sentences.

- 1 The robots that Vijay Kumar is talking about are different from unmanned aerial vehicles because they *are smaller* / *have* sensors.
- 2 To make the robot fly straight up, you increase the speed of *two* / *all four* of the rotors.
- 3 The computer in each robot sends commands to the motors *600* / *700* times a second.
- 4 A smaller robot can *fly for longer* / *turn more quickly*.
- 5 These robots can be used to *find lost objects* / *check for danger* in buildings.
- 6 Controlling the motor *power* / *movement* of the robots is very complicated, so the scientists needed to simplify the mathematics.
- 7 A 'minimum-snap trajectory' is the robot's way of flying as *fast* / *smoothly* as possible.
- 8 The team were inspired by nature when trying to programme the robots to *communicate* / *coordinate* with each other.
- 9 For lots of robots to fly in formation, it is *essential* / *impossible* to coordinate their actions in a central computer.
- 10 The disadvantage of working together to lift objects is the *risk of collisions* / *the decrease in agility*.

4. Discussion

Work in groups. Discuss the questions.

A

Which aspects of the robots' abilities are most impressive, in your opinion?

B

Vijay Kumar's talk was given in 2012. How do you think the technology has evolved since he gave his talk?

C

What are practical application of the technology do you think is most useful?

D

Vijay Kumar claims that the aerial robots have many real-world applications. Discuss other applications that the technology could have. Use these areas to think of ideas:

agriculture, cartography (map making), communications, construction and architecture, education, emergency services, espionage (spying) and secret services, industry, leisure and entertainment, retail, tourism, transport and logistics