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Diploma Programme
Programme du diplôme
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Information technology in a global society
Higher level and standard level
Paper 2 – article

19 May 2023

Zone A afternoon | **Zone B** morning | **Zone C** morning

1 hour 15 minutes

Instructions to candidates

- Do not open this booklet until instructed to do so.
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2223 – 5514

3 pages

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Theme: Medical delivery drones in Rwanda

IT system: Text messaging, GPS, drones

In many countries in East Africa it can prove fatal if a person suffers a significant loss of blood as it is not possible to transport blood to them quickly. When Alice Mutimiutugye needed a life-saving blood transfusion there was no blood matching her blood group at the remote rural clinic 80 kilometers from Kigali, the capital of Rwanda. Until recently her chances of survival would have been low.

For Alice, help arrived just in time in an unlikely form. A small package attached to a paper parachute dropped from a drone. One hour after Alice's doctors in Kigali had placed a request for blood by text, it had been delivered by drone.

When the order is received at the central base, staff pack the blood into a padded box attached to a parachute and pass it to the flight operator, who attaches it to the drone (see **Figure 1**).

Figure 1: A drone prepares for launch, Rwanda

A text message alerted the local doctor treating Alice just before the drone arrived. The drone spiraled down to an altitude of about 10 metres, using onboard sensors to measure the wind and judge the right speed and direction for the final approach before releasing its package (see **Figure 2**).

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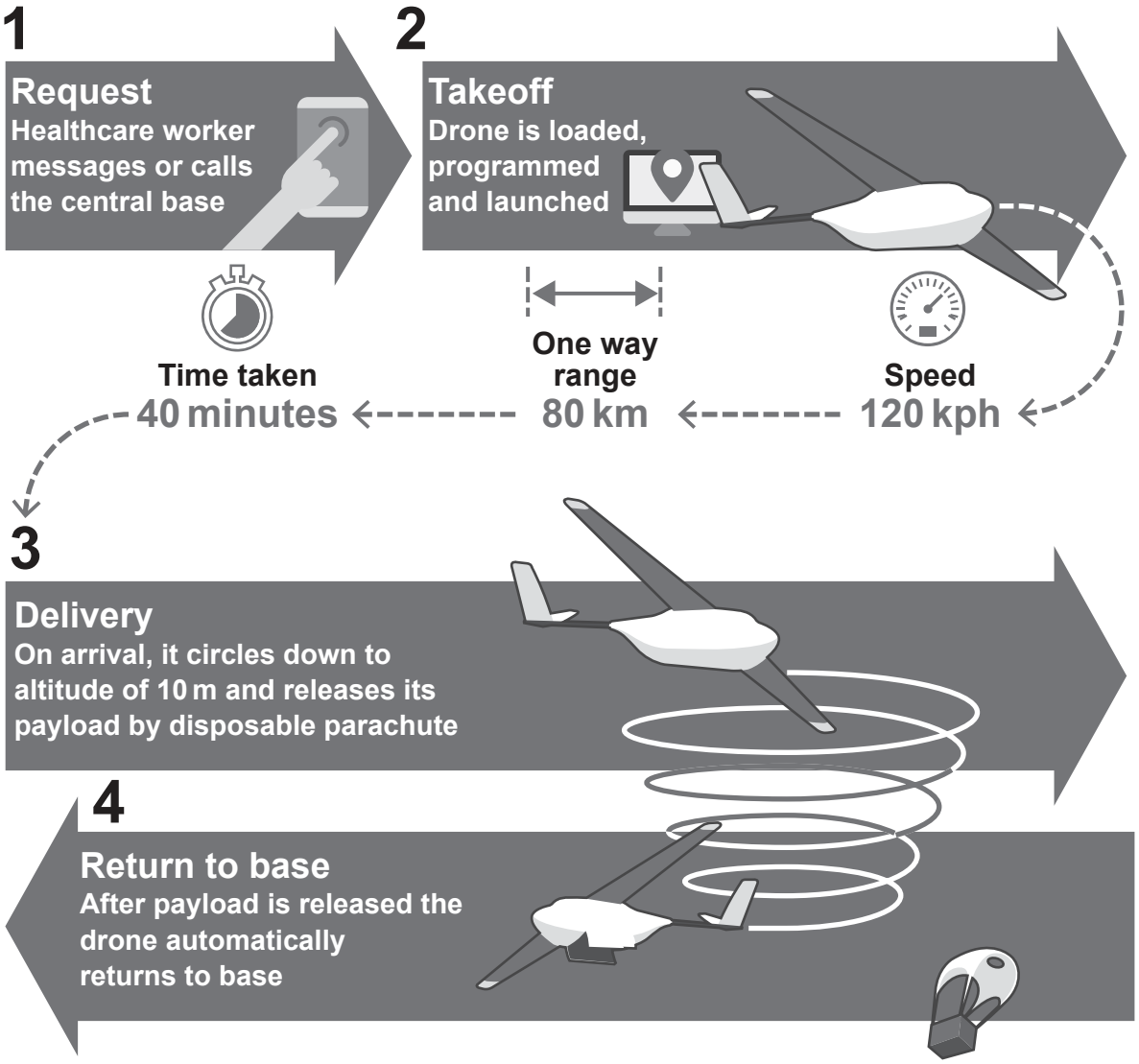
Figure 2: How drones are saving lives in Africa



15 The crewless aircraft is part of the world's first drone delivery network. It was started in Kigali by the Silicon Valley company, *Zipline* and has made more than 950 airdrops of blood in life-or-death situations in the past year.

Mr Rinaudo, a co-founder of *Zipline*, developed the technology after visiting clinics in parts of central America and Africa. These remote clinics are only accessible by dirt roads that turn to
20 mud in the rainy season. Doctors at the remote rural clinics are often unable to get the required medical supplies.

"90 % of the really difficult work is in the software and operations," said Mr Rinaudo. "We designed our flight computer from scratch, we write all the flight control algorithms and communications architecture, we designed and manufactured the aircraft."

25 It is hoped that the use of medical drones will become more widespread in East Africa. In future they could transport supplies such as vaccines, HIV medicine, snake antivenom and drugs for rabies. These diseases currently kill around 2000 people a year in Tanzania, many of whom are children.

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