Annual Media Conference
Fact Sheet Rega drone

Rega base, Dübendorf
Friday, 12 April 2019

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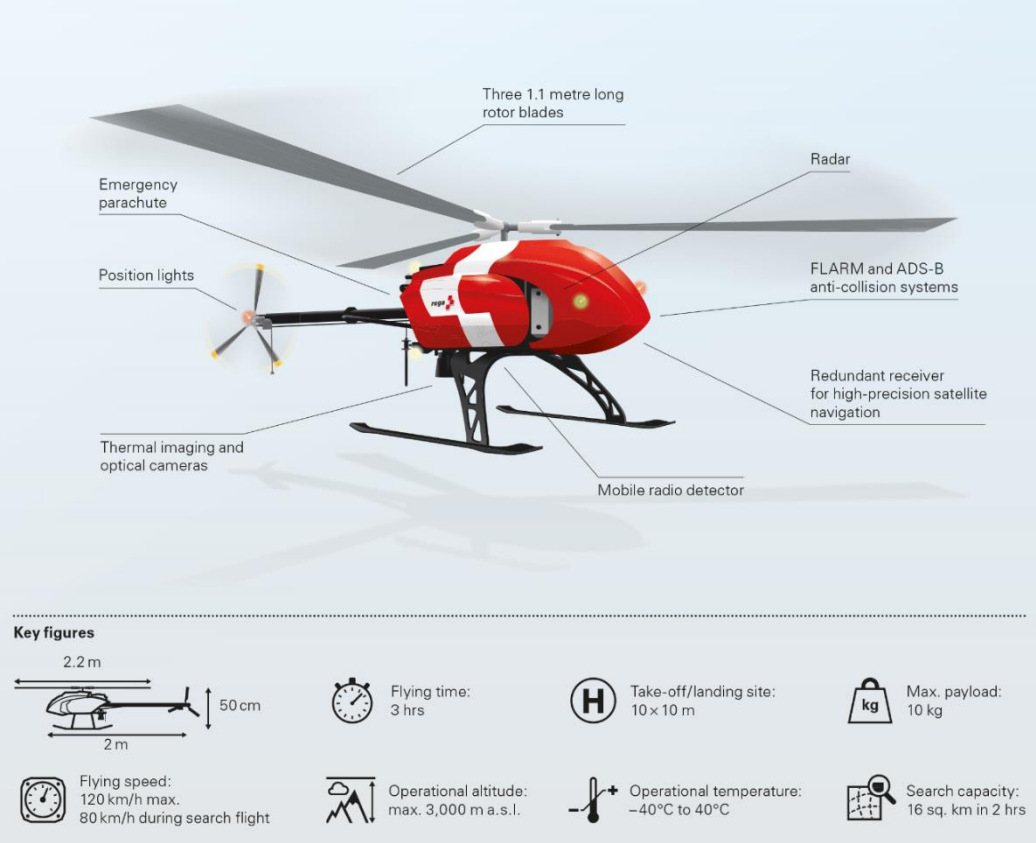
The Rega drone



The key facts at a glance

- The newly developed Rega drone unites cutting-edge technology with Rega's decades of experience in conducting search missions for missing, injured or ill persons. Such search operations are generally performed on behalf of the police.

- The drone will be used to supplement conventional resources – for example, if the risk for the helicopter crew is too high due to adverse weather conditions, or if a search at night at a low flying altitude in an area with an abundance of cables and other obstacles is too dangerous.

- The Rega drone is expected to be ready for use on search missions in 2020. It is a development project and therefore subject to certain technological risks.

- The decision as to which search method and tactics are the most suitable is made on location based on the information available at the time the alarm is raised and on the topography and weather conditions in the search area. Currently, the police can request from Rega's Operations Centre the following three search methods:

    - A search flight with a Rega helicopter from the nearest Rega base.
    - The use of the IR/EOS multi-sensor search system, which is mounted on the Rega helicopter and equipped with, among other things, an infrared camera.
    - The deployment of terrestrial mountain rescuers and terrain search dogs from the Swiss Alpine Club SAC.

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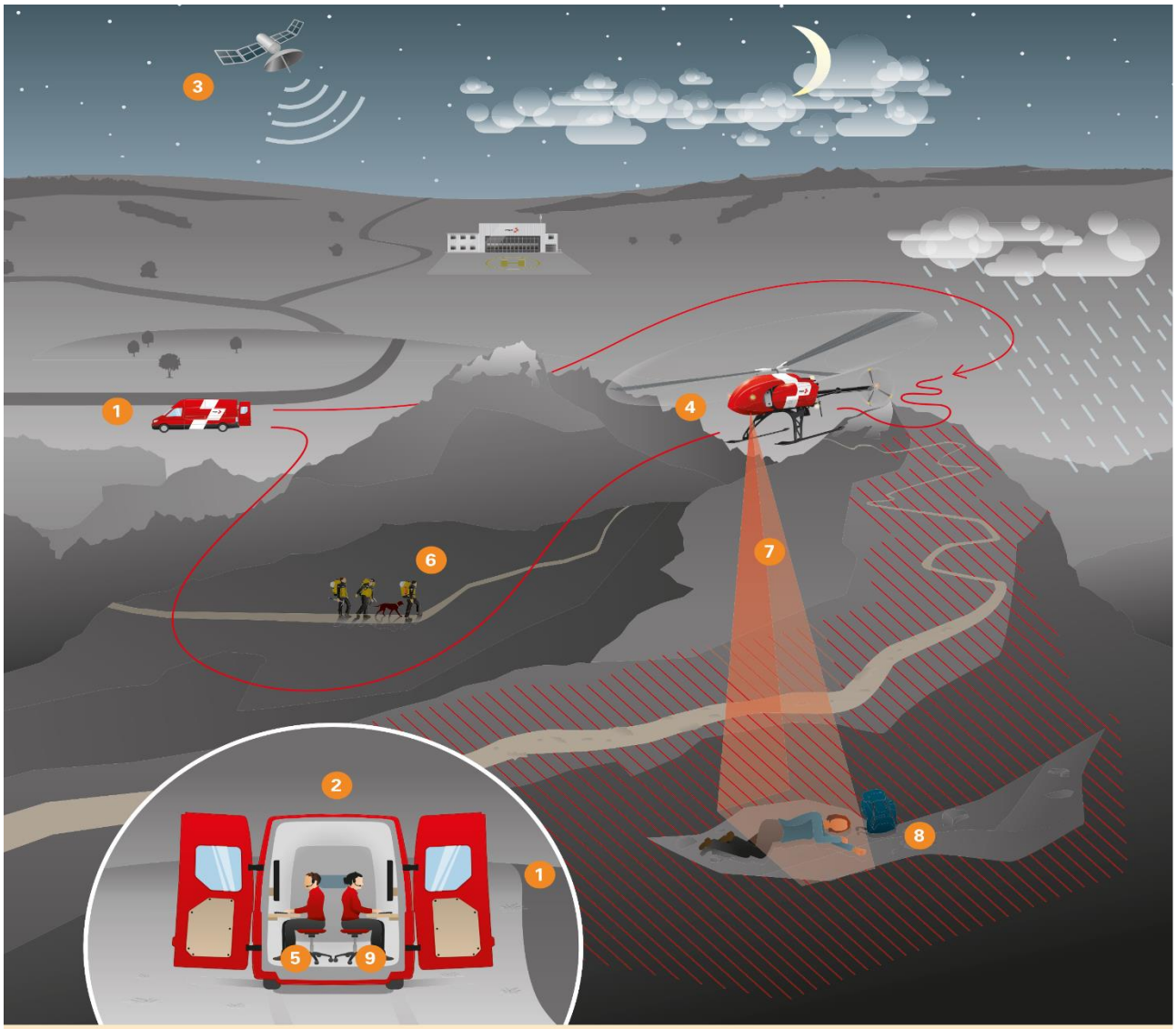

How a search is conducted using the Rega drone

After being called out by the Rega Operations Centre, the drone crew, comprising an operator and a pilot, drive to the operational area in a 1 **transport vehicle.** Inside the vehicle is the Rega drone and the 2 **ground control station,** from which the crew operates the drone without direct visual contact and monitors the data that it transmits. Thanks to 3 **satellite navigation,** the 4 **Rega drone** scans the predefined search area in an automated manner and can also be used in adverse weather conditions.
The two-person drone crew share the tasks: the 5 **drone operator** coordinates the use of the drone and acts as the link between the Rega Operations Centre and any other rescue teams on location or in the search field. These might be, for example, the police or 6 **mountain rescuers from the Swiss Alpine Club SAC.**

Based on the information available and in liaison with all those involved, the drone operator determines the search strategy and search area and informs the drone pilot accordingly. During the search flight, he tries with the aid of the 7 **camera images and other data** transmitted by the drone to locate the 8 **missing, possibly injured person** or gives the drone new instructions. The 9 **drone pilot** prepares the Rega drone for takeoff and performs the necessary checks. In consultation with the operator, he programmes the in-flight computer and, if required, obtains any permits for the drone flight. After everything has been cleared, he launches the drone manually and when it reaches a flight altitude of approximately 20 metres, he switches to autopilot mode. During the flight, he monitors the flight parameters of the drone, as well as the air traffic in the operational area, on the screen.

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Technical equipment for the flight

- **GNSS receivers**
  Thanks to two high-precision, redundant GNSS receivers enabling satellite navigation, the Rega drone flies autonomously on a predefined route with an accuracy to the metre. It follows the topography of the terrain at an altitude of around 80–100 metres above ground level. In addition, a ground radar is built into the drone in order to reliably measure its height above the ground.

- **FLARM and ADS-B**
  Like many aircraft in Switzerland, the drone is equipped with the FLARM anti-collision system and an ADS-B receiver. The FLARM signals are evaluated on board. If necessary, the drone will automatically alter its flight path in order to avoid an impending collision.

- **BVLOS procedure**
  The drone operates without visual contact with the pilot according to the so-called BVLOS (Beyond Visual Line of Sight) procedure. This requires a special permit issued by the Federal Office of Civil Aviation (FOCA) with the corresponding specific risk analysis.

Technical equipment for the search

- **Infrared and daylight cameras**
  The signals from the infrared and daylight cameras are categorised with the aid of a self-learning algorithm, which is being developed in collaboration with the ETH Zurich. The image areas in which, based on the pixel pattern, the algorithm “presumes” a person is located are relayed to the operator on the ground, who then examines this footage manually.

- **Mobile phone tracking**
  Rega is also working on being able to track mobile phones using the drone system. This method is already being used in the Rega helicopter to search for missing persons on behalf of the police. However, the devices deployed in the helicopters are not suitable for the drone, so Rega has specified the necessary modifications – in particular in terms of weight and search tactics – and, together with a manufacturer, initiated the development of a device that is suitable for use with drones. The prototype is currently being trialled in liaison with the police. This feature enables the Rega drone to locate a mobile phone from a distance of several hundred metres and thus most probably also find its owner.

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Safety takes priority

- In order to operate the Rega drone safely, Rega has taken a number of precautionary measures. For example, the drone is not deployed over densely populated regions or in the vicinity of airports and airfields, and generally does not fly higher than 100 metres above ground level. In addition, it is equipped with an emergency parachute, which will automatically open if the drone goes out of control or leaves the designated search area. The drone is manually operated during takeoff and landing so that the pilot can immediately react to unusual situations.

- Thanks to the FLARM anti-collision warning system, the drone is mutually recognisable electronically by other aircraft from a considerable distance. The drone pilot at the ground control station is constantly connected with the so-called U-space. This is an air traffic management system that is currently being set up to coordinate unmanned aircraft in jointly used airspace. It aims to prevent the drone from getting dangerously close to known air traffic.

- For the event that, despite all the precautions described above, the Rega drone does get dangerously close to an aircraft and runs the risk of colliding with it, it is equipped with an active, automatic anti-collision function. Based on the signals transmitted by the FLARM anti-collision warning system, the drone autonomously alters its flight path in good time to avoid colliding with the other aircraft. Around 80 percent of all aircraft in Switzerland, including all of Rega's helicopters, are voluntarily equipped with FLARM, and the system is also becoming increasingly popular with paraglider pilots. In the coming months, this collision avoidance function will be further enhanced by combining it with a built-in radar device.