National Aeronautics and Space Administration

TECHNOLOGY SOLUTION

Robotics, Automation and Control

Safe2Ditch Technology

Autonomous crash management to a safe and clear ditch site for small UAVs

Highly capable small UAVs provide substantial business opportunity, especially if allowed to operate in the suburban market. Reliability issues force the use of a safety pilot for each vehicle in operation, which is cost-prohibitive for large scale commercial applications and limits the use of these vehicles to line-of-site (LOS) operation. Extending the use of small UAVs to beyond visual-line-of-sight (BVLOS) and to fleet operations requires a vehicle system to autonomously perform emergency management activities as a replacement to the human pilot to maintain safety to people and property in populated areas.

BENEFITS

- Compact, lightweight and low cost
- Onboard adaptive controls allow a disabled UAV to reach a selected emergency landing zone
- Designed to operate with autopilot systems favored by the very small UAV market

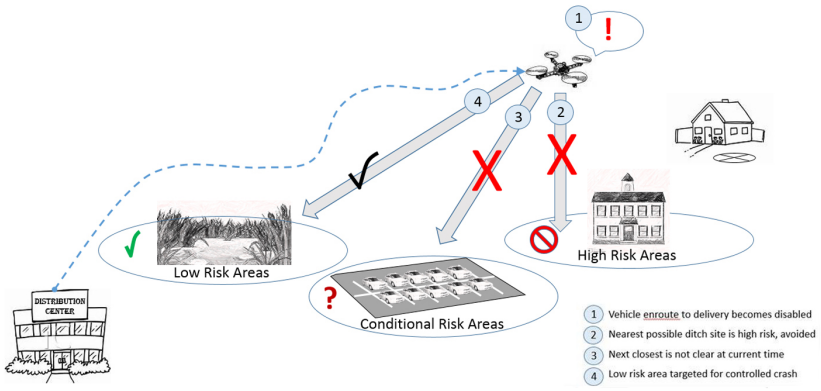
APPLICATIONS

The technology has several potential applications:

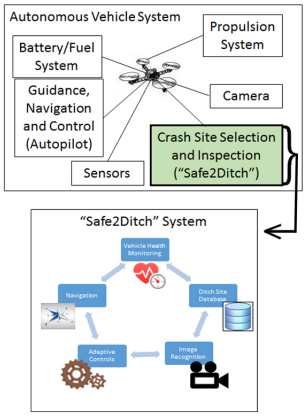
- The Safe2Ditch system will reside on small UAVs as one of several onboard systems
- A large commercial UAV market is emerging to serve the urban/suburban environment
  -Home/business deliveries
  -Live remote transmission
  -Many others (roof inspection, real estate, etc.)

THE TECHNOLOGY

Safe2Ditch is a crash management system that resides on a small processor onboard a small Unmanned Aerial Vehicle (UAV). The system's exclusive mission is emergency management to get the vehicle safely to the ground in the event of an unexpected critical flight issue. It uses the remaining control authority and battery life of the crippled vehicle in an optimal way to reach the safest ditch location possible. It performs this mission autonomously, without any assistance from a safety pilot or ground station. In the event of an imminent crash, Safe2Ditch uses its intelligent algorithms, knowledge of the local area, and knowledge of the disabled vehicle's remaining control authority to select and steer to a crash location that minimizes risk to people and property. As it approaches the site, it uses machine vision to inspect the selected site to ensure that it is clear as expected.



Sample Safe2Ditch Operational Scenario. Image credit: NASA



Overview of S2D Subsystem as part of Autonomous Vehicle System. Image credit: NASA Langley

PUBLICATIONS

Patent No: 10,403,153

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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More Information

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