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Project Results

HI-RISE

A safer, simpler process for RPAS certification

Due to a perceived lack of safety, Remotely Piloted Aerial Systems (RPAS) are not allowed to fly over built-up areas. Certification is costly and time-consuming for manufacturers, limiting market growth and the development of high-value applications. By allowing RPAS to comply with recognised safety standards, the ITEA project HI-RISE will set in motion a radical change in what is permitted and what is possible using drones.

Project origins

A common joke in aviation states that certification paperwork is done when it weighs as much as the aircraft. Unfortunately, this is not true for RPAS, also known as drones, as the certification paperwork is the same for vehicles hundreds of times larger. Further complications involve a lack well-defined and widely adopted certification processes which prove that they can safely operate over populated areas. As RPAS typically have much lower selling prices than manned aircrafts, it is also difficult to justify current certification costs (typically 100 euros per line of code). In order to open up new applications, a solution is simultaneous certification for a wide range of uses instead of on a case-by-case basis per RPAS.

To meet this challenge, the HI-RISE (High Integrity RPAS by Innovative Software Engineering) project proposes a framework within which RPAS and their innovative use-cases can be developed in a manner that satisfies the regulators responsible for the safety of such systems. This framework – consisting of processes, tools and references to available methodology – enables novel methods for handling complex error conditions. RPAS manufacturers can thereby develop safer RPAS while following aerospace standards and producing design documentation in a format which regulators find acceptable. As the majority of design safety processes are often spent cataloguing previous lessons learned, the collaborative nature of these tools will also promote information sharing between organisations for a more complete analysis with less costs and effort.

Technology applied

As RPAS must either completely or partially comply with existing safety standards, the HI-RISE framework follows the DO-178C standard for airborne aviation software. An informal DO-178C process and documentation has been developed, while simplification has been investigated via software partitioning according to what is less critical and therefore in need of fewer requirements. Other innovations include a generic modified V-model which is appropriate for RPAS and modifications to MicroPilot's software-in-the-loop simulator (SWIL) in order to simulate third-party devices.

In regard to RPAS Level Design, the Horizon Insight support website collects, processes and stores log and configuration file data from RPAS manufacturers and customers, which can be used to establish the service history of standardised RPAS components and subsystems and enables collaboration on configuration and test information. For regulatory compliance, regulatory requirements gathering is used to analyse the risks of RPAS in comparison to occupied aircrafts and develop a list of appropriate standards. These are organised and shared with RPAS manufacturers via a tool.

FLY-R Aero RPAS in Flight

Other exploitable tools created by HI-RISE include generic RPAS failure analysis (a cloud-based aerospace risk assessment process modified for RPAS) and generic system requirements which are prepopulated with common RPAS requirements in order to simplify the development of system level requirements. The generic device failure analysis and tool is based on

failure modes accumulated over the last 26 years in the RPAS industry and assesses common device failures against these. Finally, the generic RPAS design safety plan documents the processes surrounding the other tools and processes developed within HI-RISE.

Making the difference

HI-RISE is best viewed as the start of an approximately ten-year journey which will see many breakthroughs in cost-efficient, high-reliability drone design. In the short term, MicroPilot has measured a significant reduction in safety-related incidents for customers: from a peak of 15 crashes, near-misses or potential crash situations in the first half of 2018 to just four in the first half of 2020. In the long run, HI-RISE expects to reduce the time needed to perform RPAS risk assessments by two thirds.

This greater efficiency will have knock-on savings for RPAS manufacturers, helping to further grow the emerging market for drone technology. This is expected to increase in value from USD 22.5 billion in 2020 to 43 billion in 2015 at a compound annual growth rate of 13.8%; lower certification costs should mean fewer obstacles for new companies to enter this market. HI-RISE's other cost-saving innovations include simplifications to industry-accepted methods due to the lower risk of RPAS, simpler avionic architectures which are specific to a certain platform and mission and stakeholder collaboration on the development of failure assessments, requirements and other design information.

In terms of wider society, the ability to operate high-capability RPAS over cities will open up new services and dramatically reduce the cost of existing uses. Under the current situation, a drone must always be within line of sight of its operator and therefore be driven to a job site. The project intends to improve this situation in order to enable, for instance, innovations such as firefighting drones that fly directly to an emergency and begin to douse the site quicker than humans can arrive. By opening up high-value applications like this and challenging the perceived lack of safety of RPAS, HI-RISE will enable drones to reach their full potential.

Major project outcomes

Dissemination

- A number of social media posts
- Several press releases covering the various capabilities
- Webinars of Functional Hazard Assessment and Fault Tree Analysis targeted at RPAS manufacturers

Exploitation (so far)

- MP2128HELI3 Safety autopilot for RPAS
- HORIZONinsight Generic Functional Hazard Assessment enhancement
- HORIZONinsight Generic Preliminary System Safety Assessment enhancement
- HORIZONinsight Generic RPAS System Level Requirements enhancement

Standardisation

- Participating in RTCA SC-240 and EUROCAE WG-117

Patents

- US Patent on Hover Dead Reckoning filed

ITEA is the Eureka R&D&I Cluster on software innovation, enabling a large international community of large industry, SMEs, start-ups, academia and customer organisations, to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society. ITEA is part of the Eureka Clusters Programme (ECP).

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HI-RISE

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Partners

Canada

- MicroPilot

France

- Aero Composites Innovations (FLY-R)

Italy

- 2B Motori Moderni

Norway

- Griff Aviation

Spain

- Alter Technology
- Integrasys
- Venturi Unmanned Technologies

Turkey

- Aselsan

Project start

December 2016

Project end

December 2020

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