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Development of CAN-based rescue stairs

Rosenbauer has improved its rescue stairs which implement a CAN system. The company explains its new way of software development and introduces how all relevant characteristics of the 33-ton and about one million Euro rescue stairs were put in one controller.

The complete article is published in the September issue of the CAN Newsletter magazine 2021. This is just an excerpt.

When it comes to operations on or around the runway, time is of the essence: Rosenbauer developed an Aircraft Interior Access Vehicle, better known as rescue stairs in order, to be able to come to the aid of passengers and crew as quickly as possible in the event of an emergency. The vehicles have been designed to arrive on the scene of emergency quickly and dock with the aircraft equally fast. This is not only to enable evacuations in a controlled manner, but also to allow firefighting and res- cue teams quick and safe access. Rosenbauer put a lot of effort in the development of the rescue stairs. The company reduced electronics, cooperated with other companies, and used a new way of software development.

Set-up times and safety

The E5000 and E8000 rescue stairs have already proven to be the ideal vehicles that are equipped for such scenarios. During the development, particular focus was placed on safety, operation, and setup time. As a result, the crew can select an individual door at the respective type of aircraft, to automatically extend the rescue platform to the correct height. The approach to the aircraft is supported by audible and optical aids, such as distance sensors, camera imaging, and an overhead window, to ensure the best possible view in every scenario. The platform can be adjusted to match the aircraft fuselage, and the side rails can be manually docked onto it. This makes alignment easier and ensures gap-free and secure access. Thanks to sophisticated technology, the platform and steps are held in a horizontal position regardless of the incline of the staircase. This means that both evacuations and rapid access by rescue teams can be undertaken safely.

A medical emergency, smoke in the cabin, or an evacuation - in the event of an incident on board an aircraft, action must be taken quickly; Rosenbauer has improved its rescue stairs for this purpose (Source: Rosenbauer)

The rescue stairs in action (Source: Rosenbauer)

Improved operation concept

Rosenbauer, however, continuously strives to improve products that have already been refined. This is precisely why the operating concept of the rescue stairs have been revised and the latest lighting technology integrated. Feedback from Rosenbauer's customers has had a significant impact upon this further development. The crew is now given a 10-inch HD touchscreen display, both in the driver's cab and on the rescue platform, through which the rescue stairs can be controlled. The display was specifically developed together with Ginzinger Electronic Systems for the usage on rescue vehicles. The embedded system is based on an i.mx6 dual-core processor for automotive application. All functions can also be operated via hard keys if the environmental conditions or the worn gloves do not allow a touch operation.

Further the display features a brightness sensor to adjust its brightness and color theming to ensure not to irritate a driver during a night drive and still be easy to read in direct sunlight with its brightness of up to 1 000 cd/m^2. With the RBC LCS (logic control system) operating system, the rescue stairs fit into the Rosenbauer product family. This makes it easier for crew members to switch between the different vehicle types. The operation system is based on CAN technology. The control panel in the driver's cab is mounted on a swivel arm that can be rotated to either the driver's or passenger's side. In this way the operator can have everything exactly where they want it to be.

Rosenbauer's new way of software development

Not only the operation has been overhauled, but the CAN system has also been implemented from scratch. A reduction of ECUs (electronic control unit) was achieved by using ECUs from TTControl, which are certified for safety purposes. The risk and hazard analysis showed that there are safety requirements up to PLd. In the first generation of the product, the controllers available within

Rosenbauer with an established software framework had PLb only. Without the software framework, the controllers could not have been configured with the Rosenbauer service tool. Due to this constraint all safety features, like emergency stops had to be hardwired. Some safety features could only be met by software, like the tipping of the machine or levelling the platform. These features had to be programmed on different CPU (central processing unit) types and compared via CAN in terms of redundancy. This setup led to an electronic system with many relays and many different controllers. Hence it was very difficult to handle in point of servicing and troubleshooting.

Now Rosenbauer achieved to put all safety features in a single TTControl ECU which features the redundancy internally. Safety requirements like tilting and levelling are programmed by two independent developer teams, one team at TTControl in Brixen and another team at Rosenbauer in Leonding. On the ECU the multitasking real-time system Safertos is operating both

With the simulation, the development iterations can be driven to a maximum and the programmer gets off all the external influences (Source: Rosenbauer)

developed algorithms in parallel. The safety algorithm stops the machine all at once. The application algorithm takes care that the machine never moves at a position where the safety algorithm would need to take control and warns the user in advance on the display. As the TTControl ECUs combined with the Safertos guarantees the freedom of interference, the non-safety relevant application software can be maintained and deployed on the same controller. This is enabled without the need to repeat all the safety certification on every new software version. As Rosenbauer's products are varying greatly based on final customer, this is an important feature to reduce the maintenance efforts of the safety software.

If you would like to read the full article from Rosenbauer, you can download it free of charge or you download the entire magazine.

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