R2021-01 CONCLUSIONS

The conclusions include the causes of the accident or incident. A cause means the various factors behind the incident and the direct and indirect circumstances affecting it.

1. The engine compartments of Dm12 rail buses are encased to prevent snow and ice from accumulating on the chassis of the Dm12 rail bus. The casings become damaged during use, which allows combustible material to accumulate inside them.

   Conclusion: *In order to function correctly, the structure of the casing should be tightly sealed.*

2. Together with combustible material, the fuel and liquid leaks common in rolling stock can create a combustible environment in the encased engine compartment.

   Conclusion: *Liquid leaks increase combustibility and the strength of the fire.*

3. Drivers carry out maintenance and cleaning measures partially at the railway yard, and the time reserved for the purpose is limited. Drivers are not maintenance professionals. In particular, the removal of leaves and debris moistened by liquid leaks via extinguishing hatches in railway yard conditions has been difficult, and based on the investigation, it appears that it can rarely be accomplished thoroughly enough. The casing cannot be opened in railway yard conditions.

   Conclusion: *Removing combustible material from the engine compartment in railway yard conditions is impossible.*

4. Maintenance in railway yard conditions has been approved as a part of the maintenance programme. The problems related to cleaning the engine compartments during maintenance have been known. Dirty engine compartments and liquid leaks have been the most significant cause of fires.

   Conclusion: *The problems observed have not changed the way maintenance is carried out in railway yard conditions.*

5. Train personnel was removed from the Dm12 rail buses in 2015, after which the drivers have worked alone. In normal conditions, the driver of a Dm12 rail bus is responsible for duties related to passenger services in addition to driving the rail bus. When working alone, the safety of passengers depends on the driver's ability to function, expertise and experience, as well as the conditions. The risk assessment of working alone was carried out at a time when fires did not occur, and all of the risks related to them were not identified. The risk assessment has not been repeated after the fires became more common.

   Conclusion: *A comprehensive risk assessment of working alone was not carried out. In an exceptional situation, the driver working alone may expose the passengers to a major risk.*

6. The several similar safety deviations caused by fires did not initiate a new risk assessment procedure, even though the deviations were handled in accordance with the operator's safety management system.

Conclusion: *With the current method of applying the safety management system, a safety risk caused by several similar incidents may be ignored.*

7. The procedure used by the Finnish Transport and Communications Agency to monitor the operator's safety management system confirms that such a system exists, but it does not confirm that it functions.

   Conclusion: *With the current focus of supervision, the safety objectives that the safety management system is intended to achieve are not realised.*

8. The Finnish Transport and Communications Agency has identified the problems related to self-monitoring and development needs in its own supervision procedures. On the upper level, however, the problem lies in the control over the whole and putting safety management into practice between different organisations.

   Conclusion: *Control over the whole and safe actions in practice are essential in the supervision of safety management and self-monitoring. Formal compliance with the requirements of the safety management system is not enough.*

9. Drivers make decisions on how to act in exceptional situations independently based on their own competence and understanding. For example, there are no instructions for the evacuation, and it has not been practised.

   Conclusion: *The lack of training and instructions combined with working alone and the resulting hurry may lead to making independent decisions that may not necessarily be appropriate.*

10. During the investigation, fires in Dm12 rail buses from 2008 to 2021 were examined. From 2014 to 2017, no fires occurred in Dm12 rail buses. General overhauls were carried out between 2012 and 2015. After the general overhaul, there were no fires for a long time.

    Conclusion: *The fires were not caused by a fault in the basic structure of the rolling stock; however, the stock requires appropriate maintenance to function.*

11. The fire was caused by a fuel leak due to a crack in the fuel return pipe. The probable cause of the crack was material fatigue resulting from vibration and the installation tension of the pipe. The large amounts of idling related to the way the engine is used expose the pipes to more stress than planned. The engine was originally designed for industrial use, which involves less idling. The bends in the fuel pipes were not suitable, meaning that when the pipe is installed, it may remain under tension that exposes it to cracks.

    Conclusion: *The operating conditions must be taken into account in the design, material choices and maintenance of the rolling stock.*

12. The driver used the carbon dioxide fire extinguishers in the cab for first-aid extinguishing. They were not very effective in the first-aid extinguishing of the engine compartment. The dry powder extinguishers were located in the passenger cabin areas. Carbon dioxide fire extinguishers had been chosen for the cabs due to electrical causes of fire.

    Conclusion: *The differences between types of extinguishers and their characteristics related to effectiveness must be explained during training.*