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SPECIFIC TRANSMISSION MODULE (STM) - EBICAB RAMS REQUIREMENTS								
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STM

RAMS REQUIREMENTS

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Contents

1. Introduction

This railway specific project includes a specification of a Specific Transmission Module (STM) for the European Train Control System (ETCS). The module shall be adapted to the existing national Finnish, Norwegian and Swedish ATC systems (EBICAB) adopted in the future ETCS on-board equipment.

The hardware architecture of the on-board equipment as specified by the ETCS project, allows operation within the existing national infrastructures by reception of all information from the balises of the three national ATC systems.

This document specifies the Reliability, Availability, Maintainability and Safety (RAMS) requirements for the STM to be developed for the national ATC systems of the Finnish, Norwegian and Swedish Railways.

Every new requirement (normative) is preceded by a requirement number, which begins with the initial chapter letter (R), e.g. R1. The requirements are solely meant for the STM.

Explanations and notes (non-normative) are not numbered. This information is needed for clarification and shall not be regarded as requirements.

2. Applicable Standards

R1 In the design and construction of the STM, the following standards shall apply:

EN 50126 Railway applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) September 1999

EN 50128 Railway applications – Communications, signalling and processing systems - Software for railway control and protection systems March 2001

EN 50129 Railway applications – Safety related electronic Systems for signalling February 2003

R2 If the requirements in this document are not consistent with the applicable standards referred to in R1, the requirements in this document shall be applied.

3. Reliability requirement

R3 The applicable MTBF values for different failure categories shall be as follows:

Failure category	System failure mode	Effect on operation	MTBF
Immobilising	Total failure	STM operation not possible	1.2×10^5
Service	Critical functional failure	Braking, restart	1.2×10^4
Minor	Non-critical failure	Unscheduled maintenance	8.0×10^3

R4 The above failure categories are defined as follows:

Immobilising STM as switched OFF, the train shall travel without STM supervision.

Service STM as braking (service or emergency brake) the train. After RESTART or RELEASE PERMITTED, the train travels at original or reduced speed.

Minor STM as giving a failure indication to the driver without speed or functional reduction; failure calling for unscheduled maintenance meaning that the failure can be repaired under normal stop-over without influencing vehicle availability.

4. Availability requirement

Note The availability of the STM is specified as the time in which STM is in a state to perform its mission.

R5 The technical availability (A_a) of the STM module shall be at least 0.9999885.

A_a is defined as

$$A_a = \frac{MTBM}{MTBM + MTTM} \quad ,$$

where MTBM = Mean Time Between Maintenance (hours)
MTTM = Mean Time To Maintain (hours)

In this case the MTTM takes into account the mean time required to maintain rolling stock both for preventive and corrective maintenance but not including logistical and administrative delays.

5. Maintainability requirement

R6 Unless otherwise agreed, the STM shall be designed so as not to require regular periodic maintenance. In case of this kind of maintenance, the manufacturer shall specify any necessary or prohibited maintenance procedures and the Mean Time between (Planned) Maintenance (MTBM).

R7 If maintenance is needed, the Mean Time to Repair (MTTR) shall be less than 2 h.

MTTR is defined as
MTTR = Operational Standstill time for the vehicle caused by fault on STM including fault diagnosis time and check out time, but not including logistic delay nor administrative delay.

6. Safety requirement

Note. Top hazards affecting the ATC on-board system include:
- overspeed

R8 The Tolerable Hazard Rate (THR) shall not exceed $1,0 \times 10^{-10}$ f/h for the STM in the intended applications.