EUROPEAN UNION AGENCY FOR RAILWAYS

Making the railway system work better for society.

OPINION

ERA/OPI/2017-2

OF THE EUROPEAN UNION AGENCY FOR RAILWAYS

for

European Commission

regarding

CCS TSI Error Corrections

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The present document is a non-legally binding opinion of the European Union Agency for Railways. It does not represent the view of other EU institutions and bodies, and is without prejudice to the decision-making processes foreseen by the applicable EU legislation. Furthermore, a binding interpretation of EU law is the sole competence of the Court of Justice of the European Union.

1. General Context

1.1. The European Rail Traffic Management System (ERTMS) is a complex software-based system that needs constant monitoring, update and upgrading; In its capacity as System Authority for the ERTMS, the Agency has set up a change control management system for the ERTMS specifications, involving the Sector organizations, in order to collect feedback from the implementation of the system.

1.2. The findings originating from those feedback and return of experience are logged in the database of Change Requests (CR), according to Article 28 of the Regulation (EU) 2016/796 of the European Parliament and of the Council of 11 May 2016 on the European Union Agency for Railways and repealing Regulation (EC) No 881/2004[1] ("the Agency Regulation").

1.3. The Agency, in collaboration with the experts of the Sector organizations, has carried out the analysis and assessment of the CR in the database that can be considered as errors in the system specifications, with a view to identify those errors which could prevent the system to provie normal service. The results of this work is presented in this Opinion .

2. Legal Background

2.1. The Technical Specification for Interoperability for the on-board and trackside Control Command and Signalling (CCS TSI) subsystems were adopted by Commission Regulation (EU) 2016/919[2], which entered into force on the 5th of July 2016.

2.2. Article 10 of the CCS TSI Regulation reads:

> *"If errors that do not allow the system to provide normal service are detected the Agency shall publish as early as possible the respective solutions to correct them as well and the evaluation of the impact in the compatibility and stability of the existing ERTMS deployment. Within one year of the date of application of this Regulation, the Agency shall send to the Commission a technical opinion on the state of the findings logged in the ERTMS change request database. The Commission shall analyse the technical opinion, assisted by the committee referred to in Article 29(1) of Directive 2008/57/EC. As set out in the second paragraph of Article 7 of Directive 2008/57/EC, if these errors do not justify immediate revision, the Commission may recommend that the technical opinion be used pending the review of the TSI"*

2.3. The present Opinion is developed to answer to the request expressed in the paragraph above.

3. Analysis

3.1. The Agency and the Sector, relying on the work of the experts in the Agency working groups, have reviewed 40 CR in the database classified as errors, and assessed them in term of impact on the compatibility and stability of the existing specifications.

3.2. For 18 of those CR, the analysis demonstrated that they do not prevent the system from providing a normal service in any of the baselines in force.

3.3. For the other 22 CRs the analysis identified issues potentially preventing the normal service, depending on the actual use of the related functionality and on the combination of the onboard and trackside implementation.

3.4. For those 22 CR, solutions and mitigation measures have been defined and agreed, with the exception of three CR, for which additional work is planned: CR 1304 (only relevant for Level 3

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[1] *OJ L 138, 26.5.2016, p. 1–43*
[2] *Commission Regulation (EU) 2016/919 of 27 May 2016 on the technical specification for interoperability relating to the 'control-command and signalling' subsystems of the rail system in the European Union, OJ L 158, 15.6.2016, p. 1–79*
[3] *OJ L 138, 26.5.2016, p. 1.*
[4] *OJ L 138, 26.5.2016, p.102.*
[5] *OJ L 315, 3.12.2007, p. 51.*
[6] *OJ L 138, 26.5.2016, p. 44.*

applications), CR 1282 (only relevant for Euroloop), CR 1146 (Euroradio timers). Mitigation measures include i.e. restriction on the use of the the functions or their combinations, or operational procedures, that can be implemented in the short term as temporary measures to avoid the identified problems from occuring, without requesting an immediate correction to the concerned products or systems.

3.5. The Agency will make available, by publication on its website, for each of the 22 CR identified as potentially preventing normal service, the problem description, the analysis of compatibility with the Baselines in force, the solutions and the mitigation measures identified.

3.6. The Agency will actively cooperate with the NSAs and the Manufacturers, to avoid unnecessary re-authorization of the vehicles and of trackside subsystems due to those software releases.

3.7. The Agency will actively cooperate with NSAs to ensure that vehicles with on-board systems compliant with the CR solutions are not subject to National Rules developed to address those CRs.

3.8. The Agency will plan and carry out, with the help of the Sector, the compatibility analysis and definition of corrections and mitigations measures for all additional error CR logged in the database; the results will be published in accordance to Article 10 of the TSI CCS Regulation. The Agency will also make available for information the consolidated text of the specifications corrected with the solutions agreed for the CRs.

4. The opinion

Based on the above, the Opinion of the Agency is therefore:

4.1. The complete list of the CR is included in the Excel file in Annex 1.

4.2. The analysis of the impact and compatibility for each CR is included in Annex 2, together with the identified correction and the identified mitigation measures.

4.3. For each of the relevant CR, the Agency has collected the information on the current implementation status from Manufacturers and from Railways via dedicated questionnaires. The overall evaluation of the identified errors on the existing products and systems is summarized in Annex 2 based on the responses received.

4.4. Manufacturers should characterize their product and system implementations, trackside and on-board, with respect to the situation identified in each CR description, and make this information available to their customers and to the NoBos responsible for the corresponding CE certifications. The information on the on-board systems should be made available to the infrastructure managers of the networks where those vehicles are in operation. The CR solutions annexed to this opinion should be used as complementary information to the TSI set of specifications #3 (Baseline 3 Release 2) in the certification and verification process. Compliance to each CR solution should be assessed and explicitly reported by the NoBo but the non compliance to those solutions should not lead to a negative assessment of the NoBo for the purpose of the CE certification.

4.5. Infrastructure managers should analyse their trackside implementations with respect to the situation identified in each CR description, based on the information made available by manufacturers for on-board and trackside systems, considering the behaviour of the on-board systems installed on the vehicles operating on the lines.

4.6. Infrastructure managers should determine, in cooperation with the concerned RUs, if the temporary recommended mitigation measures are applicable, suitable, or necessary, depending on the implemented functions, engineering/operational rules, safety analysis. Infrastructure managers can decide whether to consider the Baseline 2 on-board systems in the decision process for the temporary mitigation measures.

4.7. The software updates of existing Baseline 3 products and systems necessary to comply with the consolidated release will be managed according to the principles defined in the ERTMS MoU signed in 2016.

4.8. Based on the above, the Agency does not consider these errors require immediate revision of the CCS TSI. Such revision of the ERTMS specifications to include all error corrections should be available not later than January 2022 and could be addressed a by the Agency through a Recommendation to the Commission to update the Annex A of the TSI CCS; this new release will include also the specifications for the Game Changer functionalities.

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Josef DOPPELBAUER
Executive Director

ANNEX 1

List of errors logged in the database of Change Requests that can prevent normal service :

CR ID	Title of the CR
0887	Position Report Consistency (Follow-up of CR556)
0940	Minimum Safe Rear End position ambiguities
0994	Text message start conditions
1120	Uncertain handling of some infill information
1146	Euroradio HDLC parameters
1166	Ambiguities in driver acknowledgement requirements
1170	Ambiguity about the list of traction systems accepted by a diesel engine
1251	Use of inconsistent or incomplete terms for the cooperative MA shortening function
1252	Ambiguities about release speed and application of A.3.4 in case a train accepts a CES
1259	Accuracy of distances measured on-board not considered when determining Release Speed from MRSP
1263	MA request condition when LoA speed is above MRSP
1264	Exhaustiveness of the list of actions not to be reverted or executed twice
1267	Acquiring the list of available networks whilst communication session is established
1282	Subset-044 chapter on safety is inconsistent with Subset-026 regarding handling of EOLM info
1288	Shortcomings due to specific locations temporarily considered as the EOA/SvL
1293	Ambiguity about clauses to be applied to messages containing high priority data
1295	TSR inhibition in SB and SR modes
1296	Wrong assumption in on-board calculation of release speed
1300	Follow-up to CR977
1304	Missing Level 3 safety requirements
1306	Undefined sequence of actions following the filtering of trackside information as per SRS 4.8
1309	Enhancement of HDLC to handle retransmission of SABME message

ANNEX 2

See separate document « BCA Report Article 10 version 1.0.0 »

ERTMS/ETCS
Error CRs Compatibility Assessment **Art10 Report**
REF : ERA_BCA_Art10 ISSUE : 1.0.0 DATE : 30/09/2017

Modification History

Issue Number Date	Section Number	Modification / Description	Author
0.1.0 13/06/17	All	Creation	AH
0.1.1 06/07/17	All	See revision marks following EECT review	AH/OG
0.1.2 25/09/17	2.2.1.2 Annex A1	Inclusion of CR1282 plus editorial fix Completion of Art10SP sheet for CR887 and 1306	AH/OG
1.0.0 30/09/17	2.2.1.6 Annex A3	Inclusion of preliminary results of ad-hoc CR questionnaires	AH/OG

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1. INTRODUCTION

1.1 Background

1.1.1.1 The Commission Regulation (EU) 2016/919 enforcing the Baseline 3 Release 2 (B3R2) of the ERTMS/ETCS specifications states in its article 10 that: *"If errors that do not allow the system to provide a normal service are detected the Agency shall publish as early as possible the respective solutions to correct them as well as the evaluation of their impact in the compatibility and stability of the existing ERTMS deployment. Within one year of the date of application of this Regulation, the Agency shall send to the Commission a technical opinion on the state of the findings logged in the ERTMS Change Request Database. The Commission shall analyse the technical opinion, assisted by the committee referred to in Article 29(1) of Directive 2008/57/EC. As set out in the second paragraph of Article 7 of Directive 2008/57/EC, if these errors do not justify immediate revision, the Commission may recommend that the technical opinion be used pending the review of the TSI"*

1.1.1.2 This report is therefore to be incorporated in the Technical Opinion submitted to the Commission pursuant to the above mentioned article 10.

1.2 Scope and Purpose

1.2.1.1 The scope of this document is to report on the analysis of the compatibility between trackside and on-board within the existing baselines (i.e. B3R2, B3MR1 and B2), in the light of the problem description of all the error CRs that were logged in the ERA database at the date of 31 December 2016, that were neither packaged in any of the three existing baselines nor in the state "rejected" or "superseded". For the error CRs whose consequences of the described problem do not allow the system to provide a normal service, trackside mitigation measures are defined for each existing baseline.

1.2.1.2 Since the article 10 of the Commission Regulation (EU) 2016/919 requests that solutions are sought for these errors preventing the normal service, this compatibility analysis also checks the compatibility on the one hand between a "B3R2 + Art10SP" trackside and an on-board compliant with an existing baseline (B3R2, B3MR1 or B2) and on the other hand between a "B3R2 + Art10SP" on-board and a trackside compliant with an existing baseline (B3R2, B3MR1 or B2). When relevant specific trackside mitigation measures are also defined for these on-board/trackside combinations.

1.2.1.2.1 Note: The term "B3R2 + Art10SP (Article 10 Service Pack)" subsystem (on-board or trackside) must be understood as a B3R2 subsystem that has implemented the solutions of all error CRs whose consequences of the described problem do not allow the system to provide a normal service.

1.2.1.3 It must be noted that for the errors identified in this report as potentially preventing the normal service within the B3R2 baseline, the solutions of the related CRs have been derived against this baseline only, no matter when and how they will be incorporated later in the TSI CCS annex A.

1.2.1.4 As long as on-board and trackside subsystems will be designed against one of the existing baselines B3R2, B3MR1 or B2, the purpose of this document is therefore to

identify/describe the potential safety hazards and/or the operational shortcomings that would prevent the normal service and to recommend mitigation measures to cope with them.

1.2.1.5 Note: The compatibility analysis will be referred with the term "BCA", which had been created in the past to refer to a similar analysis and that is still used by the parties working on this topic.

2. COMPATIBILITY ASSESSMENT

2.1 Methodology

2.1.1.1 This BCA is carried out with individual CR assessments, each of them consisting in answering questions based on the provisions laid down in the SUBSET-104 and in the annex A.1 of the ERA CCM procedure (ERA_ERTMS_0001).

2.1.1.2 To perform the CR individual assessments, a strict focus on the content of the specifications has been observed. Project or product specific considerations, quantified or not, were on purpose not considered.

2.1.1.3 Compatibility is considered to be achieved for a particular combination of on-board and trackside when the on-board is able to run a normal service on that trackside. The expression "train is running a normal service" shall be understood as "a train not penalised because of a reduction of performance or safety" (see SUBSET-104 clause 5.1.1.5).

2.1.1.4 The BCA is made of the following steps:

- Check whether each error CR identifies potential compatibility issue(s) inherent to the B3R2, B3MR1 or B2 existing baselines (see questions Q4 in the annex A.1)
- In case the assessment of an individual error CR identifies a potential compatibility issue within an existing baseline, define the mitigation measure to be applied by the trackside (see mitigations for questions Q4 in the annex A.1)
- In case the assessment of an individual error CR identifies a potential compatibility issue within the B3R2, check whether the CR solution, when applied to only one of two B3R2 subsystems, does not create any further potential compatibility issue with the other subsystem compliant with an existing baseline B3R2, B3MR1 or B2 (see questions Q1 and Q2 in the annex A.1). If necessary, the corresponding mitigation measures are defined too (see mitigations for questions Q1 and Q2 in the annex A.1).

2.1.1.5 For the formulation of the questions allowing to perform the BCA, see sheet "Explanation" in the Excel file embedded in the annex A.1.

2.2 Results

2.2.1.1 For 18 out of the 40 analysed Change Requests, the analysis demonstrated that the concerned issue does not prevent the system from providing a normal service in any of the existing baselines, i.e. they do not need any mitigation measure.

2.2.1.2 For the other CRs (i.e. those which have identified issues potentially preventing the normal service by applying the clause 2.1.1.2), mitigation measures are defined for most of them.

However, the issues identified for the following 6 CRs could not be fully mitigated:

- CR1146 (Euroradio HDLC parameters): no realistic trackside mitigation measure could be defined in case low values of T_NVCONTACT are used. It must also be noted that so far no solution enabling interoperability could be derived.

- CR1267 (Acquiring the list of available networks whilst communication session is established): although no trackside mitigation measure could be derived (B3MR1 and B2 only), in practice it is expected that only on-board equipment able to handle two radio communication sessions at a time can be put on the market, i.e. it is expected that the issue is not encountered.
- CR1282 (Subset-044 chapter on safety is inconsistent with Subset-026 regarding handling of EOLM info): the issue had been previously assessed as not preventing the system from providing a normal service, but then a hazardous scenario was identified just before the present report was due for publication, thus not allowing time to derive neither a mitigation measure nor a solution.
- CR1300 (Follow-up to CR977): this CR only concerns a B3 feature, for which one of the issues spotted by the CR could not be mitigated. It is however expected that only ETCS on-board equipment already compliant with the solution to this CR or implementing an alternative solution preventing this issue from occurring are put on the market.
- CR1304 (Missing Level 3 safety requirements): no assessment could be performed, because the whole safety analysis for a level 3 implementation (on-board and trackside safety integration) has to be done in a proprietary way without harmonised and apportioned safety requirements. In addition, the resolution of such CR is pending, waiting the further developments of the level 3 game changer project.
- CR1309 (Enhancement of HDLC to handle retransmission of SABME messages): although no mitigation measure could be derived, the implementation of the CR solution in the RBC only is sufficient because in B3R2 there are no longer RBC initiated calls and in B3MR1 or B2 the numerous functional shortcomings of the RBC initiated calls prevent in practice any interoperable use of this function (see BCA B3R2 report clause 2.2.1.3 3rd bullet).

2.2.1.3 Important note: Depending on the functionality impacted by the CR, the analysis can be slightly different for the previous baselines e.g. in case a B3 functionality does not exist in B2 or in case a B2 functionality has been removed in B3. It must however be kept in mind that the majority of these error CRs do concern the functions which existed already in B2.

2.2.1.4 The detailed analysis is given in the annex A.1. Note: all the safety related issues and their corresponding mitigations referred to in this report are described as excerpts from the SUBSET-113 (ETCS Hazard Log) in annex A.2.

2.2.1.5 The mitigation measures recommended in the embedded file identify which set of specifications is applicable (B3R2, B3MR1 or B2) and ensure that the negative consequences resulting from the issues spotted by the CRs will not occur. However, it will be the responsibility of each individual trackside implementation of ERTMS/ETCS to check whether or not a particular mitigation is applicable, suitable, or necessary, depending on its implemented ETCS functions, engineering/operational rules, safety analysis, etc.

2.2.1.6 In order to ease these checks, the Agency has also launched a survey consisting of individual questionnaires to the UNISIG on-board suppliers and to the Infrastructure Managers members of CER and EIM. By crossing their respective answers to the ad-hoc questions for each of the CRs whose problem is potentially preventing the normal service, it should be possible to narrow down the number of potential issues that could be encountered taking into account the current status of the ETCS on-board and trackside implementations. See annex A.3. for further information.

ANNEXES

A.1. Compatibility Analysis

BCA2017_v11.xlsx

A.2. Compatibility Analysis: safety related issues

A.2.1.1 This Annex contains all the "hazard log entries" that are referred to in A.1: collectively they describe all the safety related issues resulting from the compatibility analysis of the specifications, and the corresponding mitigations.

A.2.1.2 The entries here presented will be part of the version of document SUBSET-113 "ETCS Hazard Log" that is being prepared for inclusion, as Index 47, in the "List of supporting informative specifications" part of the TSI CCS Application Guide. Since this version of SUBSET-113 is not available at the time of the release of the present report, the relevant extracts - that materialize the results of the BCA for the safety related items - are transferred here.

A.2.1.3 It is to be noted that the entries are here presented in numerical order, with the IDs they have in the SUBSET-113. The correspondence between the hazard log entries and the CRs analysed can be found in the file embedded in Annex A.1.

A.2.1.4 It is also to be noted that in this annex only the hazard sheets are presented. For information about the background of their production and for details about the meaning of all the fields, the reader is directed to the SUBSET-113 which will be issued as informative specification via the TSI CCS Application Guide.

BCA report_Hazards_final.c

A.3. Questionnaires about the current status of the ETCS implementations

A.3.1. Methodology

A.3.1.1 For each of the 22 CRs which have identified issues potentially preventing the normal service by applying the clause 2.1.1.2 (with the exception of CRs 940, 1146, 1267, 1282, 1304), two specific sets of questions have been addressed to the on-board suppliers and to the Infrastructure Managers, respectively.

A.3.1.2 These questions do not consist in asking whether on-board suppliers or Infrastructure Managers have already implemented the solution of the CR. Their aim is rather to identify whether, according to the current status of their implementation with regards to each of the three current referential (B2, B3MR1 and B3R2) a specific on-board behaviour, when combined with a specific trackside implementation, can lead to the operational or safety

related negative consequences identified in section 2 as preventing the normal service. The questions are therefore not standardised and are specific to each CR.

A.3.2. Preliminary results

A.3.2.1 The six on-board suppliers from UNISIG and up to thirteen Infrastructure Managers from EIM and CER have replied to the questionnaires, which were circulated in April and May 2017 (with the exception of CR1120 and 1306 which were amended and re-circulated on 18/08/17). See details in the embedded file below.

Overview_answers_ER
A_Art10_questionnaire

A.3.2.2 Even if not all the CR questionnaires have been fully replied by all the European stakeholders, it is however already possible to make some preliminary observations:

- For the CR1288 and 1300 the answers provided by the 6 on-board suppliers show that no issue can be encountered, regardless of any trackside implementation. For the CR1300, it confirms the assumption made in the clause 2.2.1.2 4th bullet.
- For the CR 1295 the answers provided by the 13 Infrastructure Managers having responded show that no issue can be encountered on their lines, regardless of any on-board implementation.
- For the CR 1263 the answers provided by the Infrastructure Managers having responded (not all the 13) show that no issue can be encountered on their lines, regardless of any on-board implementation.
- For the CR1252 the answers provided by the Infrastructure Managers having responded (not all the 13) show that no issue can be encountered on their lines considering the answers provided by the 6 on-board suppliers.
- For the CR1120 the answers provided by the Infrastructure Managers having responded (not all the 13) show that no issue can be encountered on their lines considering the answers provided by 5 out of the 6 on-board suppliers.
- For the CR1170, 1251, 1259 and 1296 the answers provided by both the 6 on-board suppliers and by the 13 Infrastructure Managers show that on some Infrastructures, the issue(s) can be encountered with some on-board suppliers.
- For the CR994, 1166, 1264 and 1293 the answers provided by both the 6 on-board suppliers and by some of the 13 Infrastructure Managers show that on some Infrastructures, the issue(s) can be encountered with some on-board suppliers.
- For the CR887, the answers provided by both the 5 out of 6 on-board suppliers and by some of the 13 Infrastructure Managers show that on some Infrastructures, the issue(s) can be encountered with some on-board suppliers.