

T8.4.0 SS074 Test Plan

Test Plan for STM ATB

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1 Preface

Text, STMA-73221 - This document describes an integration test plan for STM ATB against the Subset-074-2 test sets. The aim is to integrate and test the STM ATB with a simulated ETCS environment at an independent test facility and run the ERA specified subset-074. Chapter 2 describes the test approach for this test plan. Chapter 3 describes the tests as listed in the proposal from the contracted testlab DLR. It also lists the requirements that will not be tested because they are out of scope. Chapter 4 lists the traceability information.



1.1 References

Text, STMA-14296 - Reference documents



All the documents references used in this document can be found in the document  [P6.1](#)

[Bibliography](#) available in the Polarion folder  [Processes](#)

Abbreviations, definitions and terminology

An overview of the abbreviations, definitions and terminology used in this document can be found in document  [P6.2 List of abbreviations, definitions and terms](#) available in the Polarion folder  [Processes](#)

Requirement identification

The STM ATB project makes use of an automated requirement management system. In this system each requirement has been identified as a work item. Each work item has been automatically assigned with a unique ID, with the format "STMA-<number>". As a result requirement ID's are not in logical order. An overview of all the used STMA-numbers is given in document  [P6.3 Requirement Overview](#) available in the Polarion folder  [Processes](#)

2 Approach

Text, STMA-72998 - This document has been created as the test plan concerning the Subset 074 tests, as described by the ERA as a mandatory set of tests to be performed on any STM. The subset 074 tests have been outsourced to the accredited test lab DLR. Because the subset 074 tests are fully described by ERA, this test plan only contains the contract between the project and DLR. Within this contract, the specific testsets have been described that are to be performed on the STM ATBEG. The underlying testcases have been specified in more detail, for this please refer to: www.era.europa.eu/index036c_-_subset-074-2_v310.zip

2.1 Identification of T1.0 Master Test Plan Test Goals

Text, STMA-17786 - Following entry and exit criteria apply to system integration tests:

Type	Criteria
Entry	<p>The module integration tests have been executed.</p> <p>All requirements documents have been verified and signed.</p> <p>All design documents have been verified and signed.</p> <p>The verified system integration test plan is available.</p> <p>A released executable code image containing all the integrated software modules is available.</p> <p>The full STM ATB hardware is available.</p> <p>Pre-compliant testing on STM ATB hardware shows no blocking, major, or minor defects.</p> <p>The automated test environment is available.</p>
Exit	<p>The system integration tests have been executed.</p> <p>Blocking, major, and minor defects and their impact on final environmental testing have been documented.</p>
Go/No-Go	Final acceptance testing by the Validation team can only start if no blocking, major, or minor defects

	have been found in the system.
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3 Test definition

Test Definition, STMA-73160 - Test plan for subset 074 tests.

Description of Work

SUBSET-074-2 TEST CAMPAIGN

31.05.2019

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1 Motivation / Background and Summary

The Institute of Transportation Systems and its ETCS reference laboratory RailSiTe® has special competence in the field of conformity and interoperability testing of ETCS-Equipment. The RailSiTe® laboratory is accredited for Subset-076 ETCS on-board unit tests and provides an accepted neutral testing infrastructure. The Institute of Transportation Systems has very deep knowledge in the field of validation and testing coming from the generation and update of the ETCS Test Specification, various EU and industrial projects in the validation and testing domain.

NS Reizigers developed a specific transmission module (STM) unit, an STM ATBEG Baseline 3 Release 2 device, which shall be tested against Subset-074-2 test cases to prove the interoperability within ERTMS.

2 Goals and Requirements

The goal of this project is a test campaign with the STM ATBEG Baseline 3 Release 2 unit, ending with a test report which can be used for the conformity certification of the STM unit. The STM unit will be tested against Subset-074-2 version 3.1.0 (test specification for STM). The tests will be highly automated to reduce the effort for retesting, which will lead to the highest possible coverage of test cases during the test phase. All findings will be exchanged between DLR and NS using agile communication in German or English. The results will be treated as confidential if necessary.

The following documents will be used:

Reference	Name of specification	Version
Subset-035	Specific Transmission Module FFFIS	3.2.0
Subset-056	STM FFFIS Safe Time Layer	3.0.0
Subset-057	STM FFFIS Safe Link Layer	3.1.0
Subset-058	FFFIS STM Application Layer	3.2.0
Subset-059	Performance requirements for STMs	3.1.0
Subset-074-1	Methodology for testing FFFIS STM (informative)	3.1.0
Subset-074-2	FFFIS STM test cases	3.1.0
Subset-074-3	Traceability of test cases with Specific Transmission Module FFFIS (informative)	3.1.0
Subset-074-4	Traceability of testing the packets specified in the FFFIS STM Application Layer (informative)	3.1.0
Subset-094	Functional Requirements for an On-board Reference Test Facility	3.1.0

The STM unit from NS does not have a data entry possibility, nor does it have a self test. Thus, the following test cases will be executed:

Reference	Name of Functionality
Subset-074-2-1	Start of Mission
Subset-074-2-2	Application Start Up
Subset-074-2-3	Level Transitions ETCS to STM



Subset-074-2-4	Level Transitions STM to ETCS
Subset-074-2-5	Level Transitions STM to STM
Subset-074-2-9	Failure
Subset-074-2-12	Procedures Override & Shunting

3 Approach/Procedure

For the tests to be performed, the Subset-074-2 Version 3.1.0 will be used. All necessary test parameters will be synchronised between NS and DLR. The test cases applicable for the STM as a device under test will be used to create corresponding test sequences. Every test sequences will be run and evaluated in detail by DLR. All results will be delivered with the internal log files of NS, if available. The test run is performed in an automated laboratory, which is configured during the integration phase. Due to this automation, the interfaces must remain unchanged during the project. Neither the time behaviour nor the interfaces is allowed to be changed. No software updates are possible during the execution of a test run.

4 Work Packages

4.1 WP1: Integration

Input: STM ATBEG Baseline 3 Release 2 unit, including any trackside simulation devices (if necessary), documentation and support during integration by NS.

Activities: The new STM unit will be integrated in the DLR RailSiTe®. All interfaces will be checked; an integration report will be created and attached to the test report. For the core software modules of the STM a checksum will be gathered by DLR, if possible, to allow the unique identification of the device under test.

Output:

- Integrated STM unit
- Integration report

4.2 WP2: Testing STM Unit

Input: Integrated STM unit (as result of WP1)

Activities: After the integration of the STM unit all selected test cases of Subset-074-2 listed in chapter 2 will be tested. This may include creation and adaption of test sequences, based on the official test specification, to create a resilient base for the official test campaign. After each test execution the test results will be analysed in detail and all deviations will be linked to certain requirements. Changing the software or hardware during this phase is not possible.

Output:

- Detailed analysis for 43 test cases.
- Direct link to violated requirement for every issue.
- Text description of the context situation.
- Depending on the counterpart at NS, communication will be in German or English.



4.3 WP3: Test Report Creation

Input: Results of WP2

Activities: The evaluation results of WP2 will be collected in a test report which allows detailed checks of every step performed during the test campaign. The level of details of the test report will be similar to the level of detail of the Subset-074 test case description.

Output: - Detailed test report for certification by Notified Body.

4.4 WP4: Synchronisation with Notified Body

Input: -

Activities: During the entire project DLR is available for meetings with the notified body, inspection of the laboratory or explanations of the report. Unlikely additional requests by the notified body must be covered in a separate contract.

Output: - Sound understanding of test report and its background by Notified Body.
- Depending on the counterpart at NoBo, communication will be in German or English.

5 Partner

NS Reizigers
Asset Management
Laan van Puntenburg 100
Postbus 2025, 3500 HA Utrecht

The work will be done on the premises of DLR and will be inter-coordinated with NS.

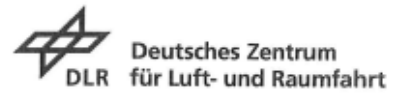
6 Timeline

A possible plan is shown in the figure below. Delayed inputs, caused by NS, will lead to an extension of the timeline.



This proposal is subject to the General Terms and Conditions of the German Aerospace Center.

Proposal-No.: 3024455



Annex 2

General Terms and Conditions of the DLR for Services (research and development)

General Terms and Conditions of the DLR for Services (research and development)

As amended in October 2017

These Terms and Conditions apply to all engagements of the Deutsche Zentrum für Luft- und Raumfahrt e.V. ("DLR") by the contractual partner for the provision of services, especially research and development services (the contractual partner and the DLR jointly referred to as "parties").

§ 1 Contract conclusion

1. The contract is concluded by explicit acceptance of the engagement.
2. All agreements including all subsequent changes, amendments, notices of termination must be recorded in writing and numbered; if contract conclusion is made in text form ("Textform" in terms of German law) (via an online portal or by email), such text form is deemed sufficient.

§ 2 Scope of performance

1. The scope of performance is determined and definitely defined by the last version of the offer issued by the DLR or the written order confirmation of the DLR following the modification of the offer by the contractual partner.
2. Changes to the scope of performance are only valid if agreed in writing resp. in text form ("Textform") according to § 1 No. 2.
3. The DLR uses its best endeavours to perform the services in accordance with state-of-the-art standards of science and technology, thereby using existing know-how and experiences resp. own know-how and experiences obtained during the cooperation, and for such purpose cooperates closely with the contractual partner.
4. It is not agreed in the contract that neither the background knowledge used by the DLR nor the works results generated by it infringe industrial property rights of third parties or other protective rights in favour of third parties; in particular the DLR is not obliged to conduct appropriate investigations, enquiries or searches. The contractual partner itself is responsible and liable if the exploitation or other use of the work results causes industrial property rights of third parties or other protective rights in favour of third parties to be infringed.

§ 3 Adjustments of the time schedule during service provision

1. If the DLR becomes aware that it is unable to comply with the agreed processing times or agreed time limits, it will inform the contractual partner of the reasons for the delay and agree with the contractual partner on a reasonable adjustment of the processing time resp. time limits.
2. The time limits agreed in the contract will be postponed accordingly if the contractual partner fails to make provisions in due time and/or in faultless condition or otherwise fails to fulfil its duties. Additional costs incurred as a result thereof are borne by the contractual partner.
3. The time limits agreed in the contract are postponed automatically in the case of unforeseen impediments that are attributable to neither of the parties, such as lawful industrial action, force majeure events, measures taken by governments and similar incidents. The duration of the postponement depends on the duration of the impediment, plus an adequate period which the party concerned requires for restart of service provision.

§ 4 Rights and duties in the case of work performed under the legal principles of a "Werkvertrag" ("Werkleistung")

If the parties have agreed work in terms of a "Werkvertrag"¹ to be performed, the following provisions apply:

1. The contractual partner is obliged to inspect and approve of the agreed work without undue delay ("unverzüglich") or within the stipulated time limit as soon as it has been performed by the DLR and the DLR has given notice of work completion.
2. Approval is deemed given if the contractual partner does not object to the notice of work completion in terms of § 4 No. 1 without undue delay ("unverzüglich") or within the stipulated time limit.
3. If the work is defective, the DLR is entitled, at its choice, to either deliver a substitute ("Neulieferung") resp. generate a new work result ("Neuerstellung") or subsequently improve the work ("Nachbesserung"). Subsequent performance ("Nachbesserung") is deemed failed after the second unsuccessful remedy attempt unless the specific nature of the item or of the defect or other circumstances require otherwise.
4. The DLR, where the task assigned to it pertains to a scientific research and development issue – where scientific, experimental or theoretical work is performed to gain know-how about unknown scientific principles, phenomena or facts – is unable to give any warranty that the expectations associated with the tasks with regard to the work results obtained will actually be met in the course of the scientific work carried out. This means that the DLR does not give any warranty for a certain research result to be obtained nor does the DLR warrant its economic exploitability.

5. Claims for defects become time-barred one year after approval of the work resp. after delivery.
6. Otherwise, the statutory provisions governing the "Werkvertrag"² (contract for work performance) apply.

§ 5 Standard of diligence

The DLR, in providing the services under the contract, exercises scientific diligence and complies with the generally accepted rules of technology.

§ 6 Remuneration

1. The remuneration is due according to the following payment schedule unless otherwise agreed between the parties:
30 % after contract conclusion / engagement;
30 % after expiry of half of the contractually agreed contract term;
40 % after completion of the contract / engagement or upon delivery of an agreed final report.
2. Payments are payable without deduction within 30 days from date of the invoice by transfer of the respective amount to the account stated in the business papers of the DLR.
3. The parties will inform each other without undue delay ("unverzüglich") if it foreseeable that the intended result cannot be obtained with the agreed remuneration. The DLR will then propose remuneration adjustment to the contractual partner.

If remuneration adjustment becomes necessary for reasons which were not foreseeable by the DLR upon contract conclusion and are not attributable to the DLR either and if no agreement can be reached with the contractual partner as regards remuneration adjustment, the contractual partner, after expiry of 2 weeks from definite failure of the attempts to reach an agreement but no later than after expiry of 4 weeks from receipt ("Zugang") of an appropriate notice from the DLR, will be entitled to terminate the contract for cause. If the contractual partner does not exercise this right within the said time limit, the DLR will be entitled to terminate the contract for cause. If the contract is terminated according to this provision, the contractual partner will bear the costs actually incurred by the DLR by that time as well as any inevitable costs already triggered by this contract.

§ 7 Liability of the DLR

1. The DLR is liable, regardless of the legal basis, for intentional conduct of its legal representatives, executive employees and other vicarious agents and persons engaged by it in the fulfilment of its obligations ("Erfüllungsgehilfen") as well as for grossly negligent conduct of its legal representatives and executive employees, whereby, in the case of an intentional or negligent injury of the life or limb or health as well as in the case of claims under the Produkthaftungsgesetz (German Product Liability Act), the liability amount is unlimited.
2. In the case of slightly negligent breach of fundamental contractual duties ("wesentliche Vertragspflichten") by its legal representatives, executive employees and other vicarious agents and persons engaged by it in the fulfilment of its obligations ("Erfüllungsgehilfen"), the liability of the DLR is limited to the compensation of the typical damage that was foreseeable upon contract conclusion. Fundamental contractual duties ("wesentliche Vertragspflichten") are duties protecting fundamental rights and legal interests of the respective other party under the contract as well as duties the fulfilment of which is indispensable for the proper performance of the contract and on the compliance with which the other party, as a rule, is reasonably allowed to rely. The DLR is not liable for slightly negligent breach of duties other than fundamental contractual duties ("nicht wesentliche Vertragspflichten").
3. In the case of grossly negligent breach of fundamental contractual duties ("wesentliche Vertragspflichten") by other vicarious agents and persons engaged by the DLR in the fulfilment of its obligations ("Erfüllungsgehilfen") other than executive employees, the liability of the DLR is limited to the compensation of the typical damage that was foreseeable upon contract conclusion. The DLR is not liable for grossly negligent breach of duties other than fundamental contractual duties ("nicht wesentliche Vertragspflichten") by other vicarious agents and persons engaged by the DLR in the fulfilment of its obligations ("Erfüllungsgehilfen") other than executive employees.
4. Otherwise, the liability of the DLR is excluded.

§ 8 Rights in results and other work results

1. The contractual partner becomes the owner of the Physical Work Results as described in the mutually agreed specifications.
If and to the extent that, in the context of service provision, industrial property rights, copyrights and other protective rights should arise, the following will apply:
2. "Other Work Results" in terms hereof are deemed to be the work results of the DLR generated or arising in the context of contract performance, including any obtained industrial property rights, copyrights and other rights that are not Physical Work Results in terms of § 8.1.

¹ "Werkleistung" in terms of German law pertains to work performed by the contractor whereby the latter undertakes to bring about a particular result.

² See footnote 1.

³ A notice is deemed received ("Zugang") in terms of German law if and as soon as it has come into the sphere of the addressee in the way that the recipient can reasonably be expected to take note of it.

General Terms and Conditions of the DLR for Services (research and development)

As amended in October 2017

3. Background knowledge is deemed to comprise all knowledge, know-how and information from the parties already available or otherwise obtained upon contract conclusion, including industrial property rights, copyrights and other rights if and to the extent that they are necessary for the cooperation or after contract termination. The Parties do not warrant that the background knowledge used and contributed in the context of the cooperation is free of industrial property rights of third parties and other protective rights in favour of third parties. The parties are not obliged to conduct appropriate investigations, enquiries or searches. However, as soon as a party actually becomes aware of any such rights, it will inform the other party to that effect without undue delay ("unverzüglich").
 4. If and to the extent this is required for the performance of the contract, the parties mutually grant to each other for the duration of the contract non-exclusive, non-transferable and gratuitous rights to use the other work results as well as the background knowledge.

The contractual partner, within a period of one year from termination of the contract, is entitled to request the DLR by written notice to grant to the contractual partner, for the time after the termination of the contract, non-exclusive, non-transferable, simple rights to use the background knowledge made available and the Other Work Results of the DLR, if this is necessary for the use of the work results.

In the case of background knowledge or other work results that are not eligible for protection, such rights of use will be granted gratuitous.

The consideration usually payable in the market is to be determined by reasonably taking the financial and non-financial contributions of the contractual partner in the generation of the other work results as well as the economic value of the Other Work Results and the background knowledge provided by the contractual partner into account. Such rights of use are granted in a separate agreement between the parties.
 5. The rights of use only exist to the extent they do not conflict with third-party rights. The parties execute, sign and deliver all documents that are necessary to mutually grant such rights to each other. In the case of inventions which employees of one party only make in the context of contract performance, the right to apply for appropriate industrial property rights is exclusively reserved to such party. This party will inform the other party after receipt of the reference number from the patent office.
 6. In the case of inventions made jointly by employees of both the DLR and the contractual partner, the parties, in their relationships with their respective employees, are obliged to claim the rights to such inventions without restrictions and jointly apply for industrial property rights in Germany, in the name of both the DLR and the contractual partner. The parties will enter into separate agreements on the use, costs, kind and scope of application etc.
- § 9 Transfer of ownership and set-off**
1. The parties, except as provided for by § 8 No. 1 with regard to Physical Work Results, remain owners of any items handed over, including drawings and technical documents.
 2. The contractual partner is granted the rights under § 8 only upon full payment of the remuneration agreed from time to time.
 3. The contractual partner is only allowed to set its own counterclaims off if they are undisputed or have been established by a final non-appealable court decision (res judicata).
- § 10 Confidentiality**
1. Information, regardless of the kind and carrier, i.e. regardless of the medium by which it is provided, which either party receives from the other party before or during the term of this contract and which, in any way whatsoever, is related to the purpose of the contract including but not limited to documents, drawings, software, know-how, data, technical, financial or personnel data as well as information relating to inventions, findings, methods etc.) is confidential provided it is explicitly, clearly and visibly marked "confidential".

Information which was disclosed orally or visually must be designated "confidential" upon disclosure and, within 30 (thirty) days from such disclosure, be listed and specified in suitable form, marked "confidential" and transmitted to the recipient. In this context, the parties are agreed that such information falls under the scope of protection of this contract during the aforesaid 30-day period already. Such information must be treated confidentially and must not be disclosed to third parties unless the respective other party consents to the disclosure in writing beforehand. The parties will commit their employees and sub-contractors accordingly. The parties undertake to treat confidential information confidentially for a period of 3 years after termination of the contract.
2. The non-disclosure obligation under § 10 No. 1 does not apply to such information and data as demonstrably
 - were generally known at the time of their disclosure;
 - were already known to the recipient at the time of their disclosure;
 - have become generally known after their disclosure with no contribution by the recipient;
 - have been made available to the recipient by third parties after their disclosure, in a legally permitted way whereby they were not subject to any restrictions in terms of confidentiality or use at that time.
 Any Party seeking to rely on one of the above exceptions shall have the burden of proof for establishing the existence of such conditions.
 3. The limitation of liability under § 7 does not apply to the preceding paragraphs.
- § 11 Publications**
1. The DLR, to satisfy the obligation imposed on it by law or the by-laws to publish any work results generated on its own, is entitled to publish scientific statements or findings.
 2. Work results generated by both parties may only be published by mutual agreement of the parties. Neither party may however unreasonably deny its consent. If either party should object to the publication within 4 weeks from cognizance, such party will be obliged to evidence its legitimate conflicting interest and submit an alternative proposal for the wording which safeguards such party's interests and at the same time enables publication.
 3. Dissertations or doctors' theses prepared in the context of performance of the contract may be published by the doctoral candidate in the framework of the procedure for conferral of a doctorate in accordance with the applicable rules of procedure governing conferral of a doctorate. The parties must approve of the subject of the dissertation/ doctor's thesis prior to the commencement of the procedure for conferral of a doctorate. Such consent must not be unreasonably denied. The aforesaid applies accordingly to any theses presented to be awarded a Diplom or Bachelor or Master degree.
- § 12 Termination**
1. Each party is entitled to terminate the contract as a whole for cause with immediate effect. The contractual partner may also terminate the contract for cause with regard to some part of the contract only. For the DLR, cause in terms hereof is in particular deemed given if the contractual partner fails to pay the remuneration due even after expiry of an additional 30-day period granted for payment. In the case of termination for cause, the contractual partner will bear the costs actually incurred by the DLR by that time as well as any inevitable costs already triggered by this contract.
 2. The contractual partner may at any time terminate this contract as a whole with immediate effect (general termination). In this case, the DLR is entitled to the agreed remuneration. The DLR must however accept deduction of any expenses it did not incur as a result of the termination of the contract as well as deduction of any amounts which the DLR earns, or in bad faith fails to earn, by using its work capacity otherwise.
 3. In the case of termination, the generated work result, if any, must be handed over or presented within a reasonable period.
- § 13 Choice of law and jurisdiction**
1. The contractual relationship is governed by German law with the exception of UN Sales Law (CISG) and Private International Law (conflict of laws rules).
 2. The place of exclusive jurisdiction is Cologne.
- § 14 Place of performance ("Leistungsort") and export control**
1. The place of performance ("Leistungsort") is the respective DLR fixed establishment in Germany that is responsible for the Physical Work Results.
 2. The contract to be concluded is subject to the condition that there are no applicable bans on export and any required export permits are granted by the competent authorities.

In case any required export permit is not granted to the DLR, § 313 BGB (German Civil Code) will apply. The same applies if any initially granted permit is cancelled or revoked later.

3.1 Not tested

Text, STMA-73209 - This section list the requirements that are not tested, because they are not in the scope of the STM. These are modelled by "test definition" work items that will not have a linked test result.

Not in scope:

074-2-6 DA functionality

074-2-7 DMI




























074-2-8 BTM

074-2-10 Specific data entry









074-2-11 Operational tests















Test Definition, STMA-73207 - Not in scope of STM.































4 Traceability























Requirement	Test Definitions
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 STMA-4240	
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 STMA-4246	
 STMA-4251	
 STMA-4253	
 STMA-15646	 STMA-73207
 STMA-4268	 STMA-73207
 STMA-4269	 STMA-73207
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