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DELIVERABLE D1 - REPORT ON TEST PLAN, TEST PROTOCOLS AND REVIEW OF TEST FACILITY CAPABILITIES

Fire risks caused by PEDs in checked-in baggage

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Deliverable D1: Report on test plan, test protocols and review of test facility capabilities

Task	1	**Evaluate the baseline performances of the selected fire test chamber for MPS tests**	
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V1.1	28/01/2025	Khiem Trad (VITO) Benjamin Bostelmann (DLR)	Added explanation of the changes made to the test plan submitted in 2022

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Introduction

The main objective of the AirPED project is to assess the effectiveness of the state-of-the-art fire suppression of a Class C cargo compartment to cope with the fire risks posed by lithium batteries that could be present in checked-in baggage. Examples of lithium batteries used for this purpose will be those that can be found inside Personal Electronic Devices (PEDs), such as mobile phones, tablets, laptop computers, e-cigarettes, etc. Although operational regulations forbid that batteries, including spare batteries and powerbanks, are carried in checked-in baggage, this project will include them in the baggage configuration to present a scenario that includes potential undeclared items.

The above-mentioned objective will be achieved through a series of tests carried in a test chamber compliant with the Minimum Performance Standard (MPS) for Aircraft Cargo Compartment Halon Replacement Fire Suppression Systems (DOT/FAA/TC-TN12/11, May 2012).

This report presents:

- an overview of the characteristics and the performances of the DLR fire test chambre and its suitability to perform the tests specified in the MPS document.
- The preliminary outline test protocols, configurations and measurements to be performed during the test scenarios.

1. Review of the DLR Test Facility and Compartment Test Chamber

Most of the fire tests will be performed at the DLR facility in Trauen, Germany. The test chamber (*i.e.* a 1:1 aircraft cargo compartment mock-up, based on the forward cargo hold of an Airbus A330/A340) has a volume of 56.6m^3 (see Figure 1) and was built in accordance with the Minimum Performance Standard for Aircraft Cargo Compartment Halon Replacement Fire Suppression Systems.

An inflight **leakage** simulation system is installed to suck air out of the chamber at a nominal rate of up to 23,3l/s through a simulated cargo door sealing as required via MPS. An adjustable passive air distribution system is installed to simulate the inflight leakages at the cargo lining from higher pressure triangle area to the cargo compartment.

Figure 1: Photograph of the fire test chamber at DLR facility in Trauen (Germany).

As it will be explained later in the test scenarios description some of the tests shall be performed in a smaller fire test chamber which will simulate the conditions of the MPS-Chamber as described below in the scenario sections.

Measurement Possibilities and Systems

A central data acquisition system with up to 80 channels will be used to measure and directly show the data of employed sensors. Temperatures will be measured with Type K thermocouples. If the measurement of heat flux will be needed, circular-foil gardon gauge will be used.

IR-Halon sensors and oxygen sensors with house calibration will be used for continuous gas measurement. The IR-Halon sensors will not be used for hot tests.

Inside the project an assessment and discussion regarding budget limitations shall show the possibilities of **the measurement of additional gases like VOC, THC, HF, HBr**. They could be measured *e.g.* with electrochemical and/or catalytical sensors from Dräger. Other measurement devices could be mutually discussed. It is planned to work with the Dräger X-AM 8000 Multi-Gas-Analyzer for up to 7 different gases. The DRÄGER-Website provides the possible sensors/gases. The system works with different modular plug-in sensors. One gas probe position will be individually defined for each test scenario. It is possible to measure eg H_2 and CO in one test and e.g. Bromide and Fluoride in another test, just by changing the sensors. The sensors are calibrated by the manufacturer. Another option would be to use wet-chemical method like Boeing did (sucking a known amount of sample air through ice water cooled plastic-tubes filled with glass beads and analyzing the condensate e.g. with ion chromatography). This method must be validated by other online measuring techniques. This method would also need an external laboratory to analyse the condensate.

A third option would be to have a FTIR gas analyser where several gases can be measured simultaneously. Such equipment is relatively expensive (based on the available budget) and would need some trainings and expertise to analyse the data.

The following Sensors are actually planned:

Sensor	Measurement
Dräger PID HC	0,3-2000ppm VOC
Dräger Dual IR Ex/CO_2 HC	0-100%UEG + 0-100%CO_2
Dräger XXS CO H_2-CP	0-2000ppm CO
Dräger XXS H_2 HC	0-4Vol% H_2
Dräger Tube Hydrogen Fluoride 0.5/a	0,5-90ppm HF
Dräger Tube Hydrochloric Acid 1/a	Indicator for HBr, HCl

Photo-, video- and one IR-camera shall be used for the visual documentation of the tests where applicable/possible (due to cooling- or lens washing gases that can't be done non-invasive inside

MPS test chamber requirements	DLR test chamber
below-floor cargo compartment wide-body shape	Yes.
Chamber Volume 56,6 ±2,8 m³	Yes. (Volume adjustable by moving the back wall and welding into position.)
Chamber leakage 23,3 ±2,3 l/s	Yes. (Leakage rate adjustable by frequency converter for water ring suction pump connected to u-shaped cargo door leackage simulator. Calibration of leackage rate prior testing with mass

	flow controller and pressure measurement inside cargo compartment.)
Return air evenly distributed and not from any one location	Yes. (Return air evenly distributed by perforated pipes on each side of cargo compartment.)
Thermocouples Type K evenly spaced along cargo compartment at 5-foot intervals.	Yes. Spacing is < 5 foot.
Continuous gas analyzer with real-time display of the extinguishing agent volumetric concentration.	DLR has Oxygen-Sensors for Tests with inerting agents. Halon-Sensors will be provided by Airbus and can be integrated.
Pressure transducer with maximum range of 0-50 psig and minimum frequency response of 3kHz.	Several pressure transducer that can be used. Or can be obtained within the project.

Test Scenario	N° of Tests	Estimated testing period	Rational/Comment
Unsuppressed Surface Burning	2	1 testing day in CW8*	Validate leakage. Demonstrate that fire does not extinguish itself.
Unsuppressed Bulk Load	2	1-2 testing days in CW21*	Validate leakage. Demonstrate that fire does not extinguish itself.
Unsuppressed Challenge Fire Test	2	1-2 testing days in CW12*	Validate leakage. Demonstrate that fire does not extinguish itself.
Unsuppressed Containerized	2	1-2 testing days in CW20*	Validate leakage. Demonstrate that fire does not extinguish itself.

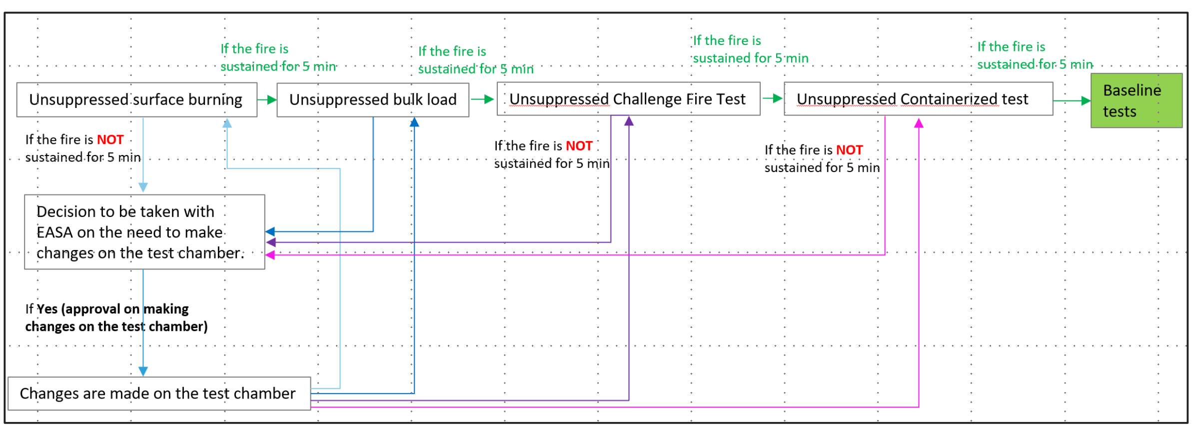

Figure 2: unsuppressed fire tests flow chart

*One testing day is estimated per scenario, but in case of problems during testing/test preparation, a backup day will be blocked. In case of procurement delays or non-availability of staff or facilities the timeslots will be shifted or changed. This table only shows the possible test slots for the duration of the hot fire tests and the individual needed preparation- and refurbishment time is not revealed in this table.

The unsuppressed tests are necessary for the following reason. During earlier projects it was observed that the test cell has to be adapted to the requirements with regards to air leakage. If the leakage provided is too low, there is a certain possibility that the fire would asphyxiate itself by consuming so much oxygen that the oxygen level would drop below the necessary level to sustain the chain reaction of a fire. This is especially valid for fire types with large open flames as the open surface fire test. And this phenomenon would deliver false measurements with regard to the suppression agent's capabilities. For this reason, a number of unsuppressed fires are performed to give a view on the "pure" behavior of the fire, i.e. without any external suppression. If these tests would show a full or partial self-extinguishment of the fires, a re-adjustment of the test cell would be necessary.

The leakage rate will be set to the MPS requirements. If the surface burning unsuppressed fire test shows that the pool fire will sustain, modification on the test setup will be performed rather than changing the leakage rate it won't be then compliant with the MPS requirements.

2. Test protocols, configurations and measurements

2.1 Baseline tests

The performances and characteristics of the cargo test chamber will be evaluated by following the Minimum Performance Standard for Aircraft Cargo Compartment Halon Replacement Fire Suppression Systems (DOT/FAA/TC-TN12/12, May 2012), which is currently under revision by the Cargo MPS Task Group of the International Aircraft Systems Fire Protection Forum (IASFPF). Newer relevant outcomes from the MPS revision process may be considered. This will include the determination of the chamber-based acceptance criteria values (peak-temperatures and temperature integrals) as an outcome of a series of MPS-Test-Scenarios with Halon 1301.

Agent Calibration

For determining the layout of the fire suppression system to be integrated into the test chamber to build up and keep the necessary agent concentrations, the first test will be a cold test to measure the concentration of agent distribution inside the MPS chamber after initiating the knockdown discharge and during the following flow metering phase. The chamber parameter (leakage rate, venting rate etc.) will be adjusted prior the agent calibration and fixed for the whole campaign.

For the measurement of halon concentrations there are two possibilities with regard to the measurement technique. The re-use of dedicated Airbus-specified sensors as they were used during the SABATAIR project would be acceptable since the AirPED campaign is intended for engineering (and not certification) tests. Besides these sensors, the usage of an AIRBUS flight test certification equipment, the so-called halonyzer, could be an option here, even if not required for this planned campaign. AIRBUS would keep this decision actually open, since the case may happen, that the test cell, qualified during the AirPED project, might be used in the future as well for agent qualification tests.

Bulk-Load Fire

The fire load for this scenario consists of 178 single-wall corrugated cardboard boxes filled with loosely packed shredded paper. Each box shall have a final weight of 1.8-2.2kg. The boxes are stacked in two layers inside the test chamber touching each other without significant air gaps between boxes.

One box in the bottom outside row with defined venting holes will be ignited by a glowing wire inside the box.

Containerized-Load Fire

The same type of paper-filled boxes and igniters will be placed inside a LD-3 container. The container is constructed of an aluminium top and inboard side, a Lexan (polycarbonate) front, and the remainder of steel. Two rectangular slots for ventilation are cut into the container in the centre of the Lexan front and in the centre of the sloping sidewall. The slots are 30.5 by 7.6 ±0.6 cm). The igniter is placed in a box on the bottom row, in the centre column next to the sloping side of the container. Ventilation holes are placed on the front face of the box facing the ventilation hole. Ten holes of 2.5-cm-diameter have been shown to be effective. Two additional empty LD-3 containers are placed adjacent to the first container.

Surface-Burning Fire

One-half U.S. gallon (1.9 l) of Jet A fuel in a square pan is used for this scenario. Approximately 385 ml of gasoline should be added to the pan to make ignition easier. 9.5 litter of water placed in the pan has been found to be useful in keeping the pan cool and minimize warping. The pan is located at the maximum horizontal distance from any discharge nozzles for all tests.

A baseline test with the aerosol can explosion simulator in the short version can be discussed.

2.2 Scenario 1: Baseline – Calibration of baggage

The objective of this test is to define a single baggage configuration, including lithium batteries, as required in task 2 of the technical specifications of the research project. This will be considered, for the purpose of this research, to be a representative baggage configuration. The selected baggage configuration should be adequate to create smoke and fire propagation from the inside to the outside of this baggage and will subsequently be used for the simulation of possible fire events in check-in baggage of passenger aircrafts.
Baggage configurations including different combinations of PEDs, power banks and spare batteries will be tested in a series of up to 5 test runs to show that batteries in thermal runaway are able to create a sustained external fire outside the baggage. The possibility of self-inerting inside the baggage pieces may also be an outcome of this scenario and could affect all the other scenarios. Only one baggage will be tested at the time on a table. Up to two fully loaded PEDs, power banks or spare batteries will be located inside the baggage together with a representative standard filling like clothes together with several examples of dangerous goods allowed in check-in baggage, such as aerosol cans or flammable liquids. Temperatures will be measured at several points outside and inside the baggage and at the PEDs, power banks or spare batteries, as applicable. The battery thermal runaway will be initiated by heat transfer to a selected cell from a heating foil or a cartridge heater.
The PEDs, power banks/spare batteries, as well as the baggage, can differ in type, model, manufacturer. Baggage can be new or refreshed. The final definition of the load shall be discussed and agreed with EASA. Special definitions for the load can possibly affect budget and time planning of all following tests and scenarios.

2.2.1 Baggage definition:

The definition of the content of the baggage including the type of materials and overall fire load will be based on an EASA document (2017)1 shared with VITO. The cargo compartment mock-up might be filled with pieces of baggage composed by a mix of PED(s), power banks/spare batteries, clothing and flammable liquid. The final definition of the baggage will depend on materials availability and budget.

[1] PED Baggage Test Plan Fire Propagation in Class C Cargo Compartment, EASA, 23/05/2017

2.2.2 PED and battery configurations

Different PEDs and battery types and configurations shall be used to initiate the thermal runaway. These may include tablet computer, laptop computer, etc. The correct PED configuration will also be defined later based on availability, delivery, and budget.

2.3 Scenario 2: Compartment floor

The objective of this test is to investigate the scenario in which fire starts from a piece of baggage that is not directly exposed to the extinguishing agent which is discharged into the compartment. This test scenario will be tested once in a semi scale environment. A representative scaled chamber will be built up to reduce the consumption of extinguishing agent. (Working with dummy loads inside the MPS-Compartment to reduce the waste of extinguishing agent or sectioning the cargo hold could also be a possible solution). A cut-out of compartment floor or representative material will be placed inside the chamber. The standard baggage's determined in scenario 1 will be used for testing. 3 by 3 baggage pieces will be placed on the floor touching each other without significant gaps. The middle baggage will be ignited in the way investigated in scenario 1. A second layer of 2 by 2 baggage pieces will be placed on top of the centre of the first layer to cover the ignition baggage completely.

2.4 Scenario 3: Compartment ceiling

The objective of this test is to evaluate the scenario in which the fire starts in a location as close as possible to the cargo ceiling level and as far as possible from the fire suppression system distribution nozzle(s). The scenario will be tested once in the chamber of scenario 2 with 8 pieces of baggage defined in scenario 1. A cut-out of compartment ceiling or representative material will be placed inside the chamber. The baggage pieces will be placed under the ceiling packed as a cube involving 2 by 2 by 2 pieces. The outer baggage of the top layer will be ignited in the way investigated in scenario 1.

2.5 Scenario 4: ULD Container

The objective of this test is to investigate the scenario in which fire starts from a piece of baggage that is not directly exposed to the extinguishing agent because it is placed inside a standard ULD container. Three LD-3 containers will be used for this test and arranged like the containerized scenario in the MPS. A minimum set of 6 baggages determined in scenario 1 will be placed inside the middle container. Dummy load will be used to fill up the whole container. Unburned standard baggages from the scenarios 1 to 3 can also be recycled to fill up the container.

2.6 Scenario 5: MPS Challenge Fire Test

A series of Challenge Fire Tests that represent a complex fire likely to occur will be tested directly in the baseline testing campaign to ensure a stable chamber setup. The setup of the challenge fire test will be designed in accordance to the definitions which are in actually ongoing discussion at the international cargo compartment MPS task group of the International Aircraft Systems Fire Protection Forum.

2.7 Scenario 6: Halon Replacement

The tests in this scenario will be performed in the MPS chamber under the same conditions as the baseline tests. The agent to choose for Halon replacement tests shall be an agent, which has not yet been tested against the MPS, nor will be covered by any other actual or planned research projects, like CO_2 or an inert gas or combinations thereof. Each MPS-Scenario and the challenge fire test from scenario 5 will be tested at least once in the same way as during the baseline campaign.

2.8 Scenario 7: Involvement of a bulk shipment of cells/batteries in an external fire event

The full scale external fire tests performed during the Sabatair project showed that a state-of-the-art Class C cargo compartment built-in fire suppression system combined with the use of fire containment covers (FCC) could prevent the involvement of lithium cells/batteries in an external cargo fire event. However, due the limited number of tests, statistical evidence could not be achieved for the tested combination of cell type, quantity and state of charge during the afore mentioned project.

To confirm the effectiveness of this protection measure especially for batteries (*i.e.* an assembly of at least two cells connected electrically with or without controlling electronics) further investigation is required. Actually a thermal runaway occurring at one of the cells, composing the battery, can easily and rapidly propagates to the adjacent cell(s) which may end with a sever thermal runway event as the combination of the energy of the cells is high.

To align with the work that will be carried out during this project in the scenarios described above, PED batteries[2] would be chosen for this scenario (see example in Figure 3). This choice was corroborated with a literature study that showed limited test results of fire tests on bulk PED batteries.

The PED batteries that would be interesting to investigate in this project can be mobile phone batteries (which are expected to have a max 10Wh) and/or laptop batteries (>60wh). These batteries are constituted

[2] PED batteries include, for example, batteries that power mobile phone, laptop, tablet batteries.

with at least two connected cells and in some cases some electronic components are added. The pricing range can vary from less than 10 € for a phone battery to more than 1 hundred of euros for a laptop battery. The predominant chemistry in these is the Lithium nickel manganese oxides as positive or more commonly known as NMC. This chemistry is was shown to have the most severe failure consequences as release of high energy, smoke and fire. These batteries may also release harmful chemicals when burst.

Additionally, the combustion of the material that is used as additional packaging and the electronic components that can be added to the cells can lead to more severe consequences of the battery thermal runaway (e.g., more smoke or more fire combustion).

These kind of PED batteries can be easily purchased, and they can be found in a wide range of price and probably with possible noncompliance of some batteries with the existence safety standards (see examples Figure 3). Preliminary thermal abuse tests might be performed on a selection of cells to evaluate the severity of their thermal runaway consequences.

These batteries can also be found in different sizes (ie capacity and voltage).

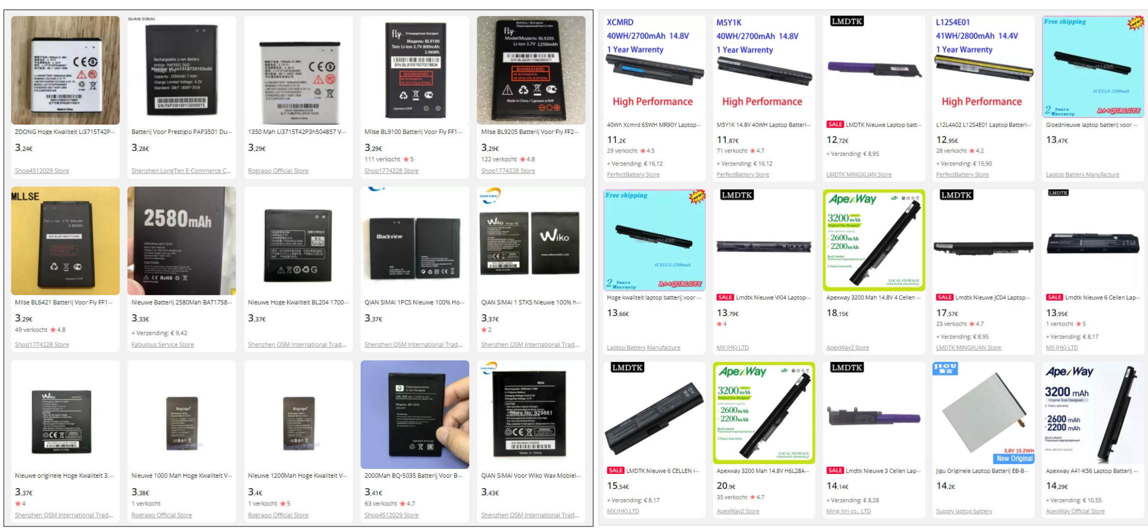

Figure 3: example of commercially available mobile phone batteries (on the left side) and laptop batteries (on the right side) Source: online shop

Due to the limited budget that would be allocated to this scenario (less than 1%) hundreds of batteries will be used in each of the two tests that will be introduced below. The batteries to be tested can be a mix of mobile phone batteries and laptop batteries with different qualities and sizes. The choice of the brand and the quantity of the batteries will be probably be affected by the availability of the batteries and their delivery time.

Additionally, depending on the outcome of the previous test scenarios and after discussion with the contracting authority, the tests of scenario 7 might be adapted.

To accurately estimate the thermal runaway temperature onset of the selected battery, a pre-test will be carried out in an accelerated rate calorimeter that VITO is equipped with (see Figure 4). A simulation of a fire test (*i.e.* the PED will be directly exposed to fire) can be performed and would give information on would the selected battery reacts *i.e.* time to thermal runway, temperature onset and energy release. This could be an important and influencing input to prepare the full-scale fire test in the MPS test chamber.

Figure 4: VITO's ARC machine where thermal abuse test can be safely performed and monitored on a cell/battery module

Two main tests will be carried out. The first one would be the 'Scenario 7 baseline' where no additional protection measures will be used *i.e.* the batteries will be placed in their original packaging and exposed to fire. The tests will be performed in the test chamber representative of the design of a Class C cargo compartment installed on a large aeroplane as described above.

And the second test would be designed based on the outcome of the scenario 7 baseline, where additional mitigating measures will be added like a fire containment cover. Additionally, to prevent a potential propagation of the thermal runway from a battery box to others or to an adjacent MPS box, thermal isolation material will be used as separation between the boxes.

The fire suppression system will be activated in both cases to assess the effectiveness of the fire suppression agent with and without the additional protection measures.

3. Test plan

This test plan will o be updated regularly by the consortium after discussion with the contracting authority. The test plan might be modified and adapted in case of test failures or a need to run other tests rises during the execution of the tests.

Test Scenario	N° of Tests	Estimated test period	Rational/Comment
Surface burning & Halon 1301	3	2 days in CW 23*	Determine pass/fail criteria
Bulk Load & Halon 1301	3	3 days in CW 26*	Determine pass/fail criteria
Containerized & Halon 1301	3	3 days in CW 24*	Determine pass/fail criteria
Challenge Fire Test & Halon 1301	3	3 days in CW 28*	Determine pass/fail criteria Check/confirm if pass/fail criteria from bulk-load test can be applied
Challenge Fire Test & Halon replacement	3**	3 days in CW 30*	The other replacement tests are reduced to two
Surface Burning & Halon replacement agent	1**	1-2 days in CW 31*	
Bulk Load & Halon replacement agent	1**		
Containerized & Halon replacement agent	1**		
Calibration of baggage	3	1 day in CW 33*	Minimum of 3 tests after finding the right baggage with the most severe fire production
Compartment floor	1	1 day in CW 39*	
Compartment ceiling	1	1 day in CW 39*	
ULD container	1	1 day in CW 39*	
Involvement of a bulk shipment of cells/batteries in an external fire event	2	2 days in CW 41*	

*In case of procurement delays or non-availability of staff or facilities the timeslots will be shifted or changed. This table only shows the possible test slots for the duration of the hot fire tests. The individual needed preparation-and refurbishment time is not revealed in this table.

** Two more Challenge Fire Tests are planned, due to additional costs it is possible to test Surface Burning and Bulk Load OR Surface Burning and Containerized.

4. Updates:

The test plan originally submitted in 2022 underwent several changes due to unforeseen challenges encountered during the project. The unexpected sick leave of the DLR expert managing the testing rig created a gap in expertise, which slowed progress significantly. Although a replacement was appointed (several months later), additional time was needed for them to fully understand the project and its requirements. There were also issues with tracing data from earlier tests, which required additional effort to ensure accuracy and consistency. Incomplete MPS test documentation further complicated matters, resulting in revisions and adjustments to the initial testing plan. Due to an (already) tight budget, changes in the test plan forced the removal of some tests from the initial plan (see section test plan above) and changes to the overall test plan. These combined factors have delayed progress and required updates to the project timeline. Below is an excerpt from the list of tests performed during this project. A detailed table will be attached to this document and shared with EASA for reference.

Sequential number	Date	Test	Leckage configuration	Fire load	Agent	Test Duration
1	########	MPS open Surface, unsuppressed	passive	Fire Pan	none	≥10 minutes
2	########	MPS open Surface, unsuppressed	passive	Fire Pan	none	≥10 minutes
3	########	MPS open Surface, unsuppressed	passive	Fire Pan	none	≥10 minutes
4	########	MPS open Surface, unsuppressed	passive	Fire Pan	none	≥10 minutes
5	########	MPS open Surface, unsuppressed	passive	Fire Pan	none	≥10 minutes
6	########	MPS open Surface, unsuppressed	passive	Fire Pan	none	≥10 minutes
7	########	MPS open Surface, unsuppressed	passive	Fire Pan	none	≥10 minutes
8	########	MPS Containerized, unsuppressed	passive	LD3 Containers	none	~85 minutes
9	########	MPS Containerized, unsuppressed	passive	LD3 Containers	none	~85 minutes
10	########	MPS open Surface, unsuppressed	passive	Fire Pan	none	≥10 minutes
11	########	MPS open Surface, unsuppressed	passive	Fire Pan	none	≥10 minutes
12	########	MPS Bulkload, unsuppressed	passive	Bulk-Load	none	~60 minutes
13	########	MPS Bulkload, unsuppressed	passive	Bulk-Load	none	~130 minutes
12	########	Halonizer Test (fail)	passive	none	Halon 1301	
13	########	Halonizer Test	passive	none	Halon 1301	
14	########	MPS open Surface, Halon	passive	Fire Pan	Halon 1301	≥15 minutes
15	########	MPS open Surface, Halon	passive	Fire Pan	Halon 1301	≥15 minutes
16	########	MPS open Surface, Halon	passive	Fire Pan	Halon 1301	≥15 minutes
17	########	MPS Containerized, Halon	passive	LD3 Containers	Halon 1301	~180 minuntes
18	########	MPS Containerized, Halon	passive	LD3 Containers	Halon 1301	~35 minutes
19	########	MPS Containerized, Halon	passive	LD3 Containers	Halon 1301	≥30 minutes
20	########	MPS Bulkload, Halon	passive	Bulk-Load	Halon 1301	≥30 minutes
21	########	MPS Bulkload, Halon	passive	Bulk-Load	Halon 1301	~175 minutes
22	########	MPS Bulkload, Halon	passive	Bulk-Load	Halon 1301	≥30 minutes
23	########	MFF, unsuppressed	passive	MFF	none	≥30 minutes
24	########	MFF, unsuppressed	passive	MFF	none	≥30 minutes
25	########	Baggage Scenario 1 (Test 1)	-	single bag 1	none	
26	########	Baggage Scenario 1 (Test 2)	-	single bag 2	none	
27	########	Baggage Scenario 1 (Test 3)	-	single bag 3	none	
28	########	Baggage Scenario 1 (Test 4)	-	single bag 4	none	
29	########	Baggage Scenario 1 (Test 5)	-	single bag 5	none	
30	########	Baggage Scenario 1 (Test 6)	-	single bag 6	none	
31	########	Spray can test in compartment (1)	-		none	
32	########	Spray can test in compartment (2)			none	
33	########	Spray can tess in compartment (3)			none	
34	########	Spray can test in compartment (4)	-		none	
35	########	Leakdown Test			N2	
36	########	Natural Leakdown Test			N2	
37	########	Baggage Scenario 1 (Test 7)		single bag 7	none	
38	########	Flam. Fluid Igniter Test (1)		2x 125ml ethanol bottle	none	
39	########	Flam. Fluid Igniter Test (2)		1x 125 ml ehtnaol bottle	none	
40	########	Flam. Fluid Igniter Test (3)		2x 125ml acetone bottle	none	
41	########	Flam. Fluid Igniter Test (4)		2x 125ml acetone bottle in case	none	
42	########	Flam. Fluid Igniter Test (5)		2x 125ml acetone bottle in case	none	
43	########	Flam. Fluid Igniter Test (6)		150ml acetone bag in case	none	
44	########	Leakdown Test			N2	
45	########	Leakdown Test			N2	
46	########	Spray can test in compartment (5)		50 ml Shaving Cream	none	
47	########	Spray can test in compartment (6)		50 ml Hair Foam	none	
48	########	Spray can test in compartment (7)		50 ml Hair Foam with arc ignitor	none	
49	########	Spray can test in compartment (8)		75 ml Hair Spray	none	
50	########	Spray can test in compartment (9)		75 ml Hair Spray	none	
51	########	Spray can test in compartment (10)		75 ml Water Spray	none	
52	########	MFF, unsuppressed	active	MFF	none	≥30 minutes
53	########	Artificial Fire Source Test (1)		Artifical Fire Source	none	
54	########	Artificial Fire Source Test (2)		Artifical Fire Source	none	
55	########	MFF, unsuppressed	active	MFF	none	≥30 minutes
56	########	MFF, Halon	active	MFF	Halon 1301	≥30 minutes
57	########	Artificial Fire Source Test (3)		Artifical Fire Source	none	
58	########	Baggage Scenario 1 (Test 8)		Artifical Fire Source	none	
59	########	Baggage Sceneario 2	active	baggage	Halon 1301	≥30 minutes
60	########	Baggage Sceneario 3	active	baggage	Halon 1301	≥30 minutes
61	########	Commissioning Test N2 Demonstrator			N2	
62	########	Commissioning Test N2 Demonstrator			N2	
63	11/11/2024	Commissioning Test N2 Demonstrator			N2	
64	11/11/2024	Commissioning Test N2 Demonstrator			N2	
65	12/11/2024	MFF, N2	active	MFF	N2	≥30 minutes
66	########	MFF, N2	active	MFF - 180min version	N2	≥180 minutes

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