

AATRIZINVENTOR SOLUTION FOR INNOVATION BASED ON NATURE'S L.I. Working Document to Build a Specific Solution.

INNOVATION CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

APPLICATION OF NATURE'S LANGUAGE OF INNOVATION / Nature's L.I.

Web site: www.aatrizinventor.com

Reference book: The Nature's Language of Innovation, José Roberto Espinoza, Amazon, Kindle.

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FACTORS OF INNOVATION:

FUNCTION AFFECTED: Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

PHYSICAL VARIABLE OR CHARACTERISTIC: Less Ability to avoid impact of water entry

S1 OBJECT: CARGO SPACE WITH WATER, (Stationary relative to the Ferry) Type: Stationary

S2 OBJECT: FERRY (stationary relative to the Cargo Space) Type: Stationary

DESIRED ACTION VERB: Improve

INNOVATION CHALLENGE:

CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

DESIRED GOAL: More Ability to avoid impact of water entry

EVALUATED OBJECT: CARGO SPACE WITH WATER, (Stationary relative to the Ferry)

NEED TO SATISFY > 34. Ease of change, repair or maintain

SELECTED INNOVATION PARAMETERS TO EVALUATE:

A. UNDESIRABLE EFFECTS CAUSES OF DISSATISFACTION (UDEs)

There are More difficulty to Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch because:

CARGO SPACE WITH WATER, (Stationary relative to the Ferry) Has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

CARGO SPACE WITH WATER, (Stationary relative to the Ferry) Has Less Achievement of desired outcome interacting with S2

CARGO SPACE WITH WATER, (Stationary relative to the Ferry) Has More Harmful factors affecting S2 by mutual interaction

CARGO SPACE WITH WATER, (Stationary relative to the Ferry) Has More Adaptability or versatility to interaction variability of S2

There are undesirable effects that cause dissatisfaction because:

There is Less Ability to avoid impact of water entry

B. DESIRED EFFECT FOR NEED TO SATISFY

There is More ease to Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch because:

CARGO SPACE WITH WATER, (Stationary relative to the Ferry) Has More Desired ease of change, repair

or maintenance to interact with S2

There is desirable effect for need to satisfy because:

There is More Ability to avoid impact of water entry

Table I. RELATIONSHIP WITH UNIVERSAL TRIZ INNOVATION PARAMETERS (maximum of 7 undesirable effects)

CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

This table presents the selected innovation parameters to evaluate the challenge that must be resolved for the interaction between an Object S1 and an Object S2, and no others. The choice of undesirable effects must be based on a thorough review of the current situation, identifying them based on the objective evidence present within the predefined space and time of evaluation. Fulfilling this requirement is crucial: If you do not connect the dots of the current situation properly, the algorithm will deliver a disconnected solution.

The selection of the need to satisfy should reflect the best estimation of the innovation-evolution state of the object S1 being evaluated.

Recognizing the criticality of this selection process, the Aatrizinventor algorithm provides flexibility to change parameters and conducts a sensitivity analysis in order to offer alternative solutions. These alternatives are based on different combinations of the entered parameters, also including a different need to satisfy from the one originally posed.

Parameters to evaluate(s)	It is understood as CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has:
Parámetros of undesirable effects (UDE):	Undesirable effects causes of dissatisfaction:
(+) 2. Heaviness of stationary object	More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2
(-) 29. Fulfillment of desired outcome	Less Achievement of desired outcome interacting with S2
(+) 31. Object-generated harmful factors	More Harmful factors affecting S2 by mutual interaction
(+) 35. Adaptability or versatility	More Adaptability or versatility to interaction variability of S2
Desirable parameter (DE):	Desirable Effect for Need to satisfy:
(+) 34. Ease of change, repair or maintain	More Desired ease of change, repair or maintenance to interact with S2
TRIZ undesirables parameters for sensitivity analysis	It is understood as CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has:
(+) 8. Volume of stationary object	More Own physical volume or accumulated quantitative volume or three-dimensional scope interacting with S2

(-) 12. Shape / composition / configuration	Less Appropriate shape, composition, or configuration interacting with S2
(+) 24. Loss of Information	More Loss of information or lack of communication interacting with S2
n/a	
n/a	

EVALUTION RESULTS TABLES

TABLE II. SPECIFIC CONTRADICTION MATRIX FOR UNDESIRABLE EFFECTS AND NEED TO SATISFY. FOR EVALUATED OBJECT: CARGO SPACE WITH WATER, (Stationary relative to the Ferry) AND NEED TO BE SATISFIED > 34. Ease of change, repair or maintain

CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

(*) Preferred parameters: Improve 2. Heaviness of stationary object & Attenuate or preserve 29. Fulfillment of desired outcome.

Contradictions/ E.C: Essential, Comp.:Complementary, Top 5: Up to the major fifth, noted if outside the preferred parameters.

Parameters in the first row are the same as those in the first column.

Parameter to attenuate or preserve => Parameter to improve	Var.	(+) Par.2	(-) Par.29 PREF.	(+) Par.31	(+) Par.35	(+) Par.34	Sum wt
(+) 2. Heaviness of stationary object PREF.	wt		wt.1 E.C.	wt.7 Compl.	wt.12 Compl.	wt.9 Compl.	100%
	IP(s)	0,0,0,0	10,1,35,17	35,22,1,39	19,15,29,0	2,27,28,11	
(-) 29. Fulfillment of desired outcome	wt	wt.11		wt.14	-	wt.5 Top 5	38%
	IP(s)	28,35,27,9	0,0,0,0	4,17,34,26	0,0,0,0	25,10,0,0	
(+ 31. Object-generated harmful factors	wt	wt.8	wt.13 Compl.		-	-	22%
	IP(s)	35,22,1,39	4,17,34,26	0,0,0,0	0,0,0,0	0,0,0,0	
(+ 35. Adaptability or versatility	wt	wt.10	-	-		wt.2 Top 5	47%
	IP(s)	19,15,29,16	0,0,0,0	0,0,0,0	0,0,0,0	1,16,7,4	

(+) 34. Ease of change, repair or maintain	wt	wt.6	wt.4 Compl.	-	wt.2 Top 5		71%
	IP(s)	2,27,35,11	25,10,0,0	0,0,0,0	7,1,4,16	0,0,0,0	
Sum wt		53%	90%	22%	45%	67%	

This table shows the essential contradiction (E.C.) that determines the solution strategy. Additionally, preferred parameters are established where complementary contradictions (Compl.) are found, allowing the definition of the Base Solution shown in Table III.

As a complement to the Base Solution, Table II also provides the following information that could be relevant to obtain an optimal solution:

- The algorithm identifies the top 5 contradictions from the entire Table II and highlights those that are outside the preferred parameters for further review.
- There are inventive principles present in Table II that are not part of the Recommended Solution proposed in Table V. In the latter, the top three most relevant ones are highlighted, and the contradictions they involve are presented to evaluate whether they contribute significant aspects to the desired solution. For further details, Table VIII provides a prioritization of the inventive principles from Table II, and those not included in the Recommended Solution in Table V are marked with ***.

TABLE III. BASE SOLUTION FOR THE EVALUATED OBJECT: CARGO SPACE WITH WATER, (Stationary relative to the Ferry)

NEED TO SATISFY > 34. Ease of change, repair or maintain

CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

Table II Selection: Essential Contradiction wt.1 y Complementary contradictions with preferred parameters (*) wt.4/wt.7/wt.9/wt.12							
Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(+) 2. Heaviness of stationary object	(-) 29. Fulfillment of desired outcome	Essential	wt.1	10 Es.	1 Es.	35 Es.	17 Es.
(+) 34. Ease of change, repair or maintain	(-) 29. Fulfillment of desired outcome	Compl. 1	wt.4	25	10 Es.	0	0
(+) 2. Heaviness of stationary object	(+) 31. Object-generated harmful factors	Compl. 2	wt.7	35 Es.	22	1 Es.	39
(+) 2. Heaviness of stationary object	(+) 34. Ease of change, repair or maintain	Compl. 3	wt.9	2	27	28	11
(+) 2. Heaviness of stationary object	(+) 35. Adaptability or versatility	Compl. 4	wt.12	19	15	29	0

Inventive Principles (IP) selected for the Base Solution

- IP.10. Preliminary Action - strategic type
- IP.1. Segmenting/ Integrating - strategic type
- IP.35. Transformation / Parameter Changes - strategic type
- IP.17. Another Dimension or Field - tactical type
- IP.25. Self-service - **operative type**
- IP.22. Convert harm in benefit - strategic type
- IP.39. Inert Atmosphere / Environment - **operative type**
- IP.2. Taking out/ Adding - strategic type
- IP.27. Cheap Short-Living Objects - strategic type
- IP.28. Mechanics Substitution - strategic type
- IP.11. Beforehand Cushioning - tactical type
- IP.19. Time-Varying Action/ Periodic or Pulsating - strategic type
- IP.15. Dynamics - strategic type
- IP.29. Controllable Soft Variables - tactical type

Table III shows the essential contradiction, the one with the highest weight, plus the following 4 complementary contradictions in weight, which are located in the row and column of the preferred parameters selected in Table II. These contradictions are considered relevant for the solution and are described as the Base Solution in Table IX.

Keep in mind that all inventive principles selected for a solution must be evaluated according to the specific context of the contradictions in which they participate.

Inventive principles marked with 'Es.' correspond to inventive principles that belong to the essential contradiction.

TABLE IV. CONTRADICTION MATRIX COVERAGE FOR SOLUTION AMONG NEEDS TO SATISFY FOR EVALUATED OBJECT: CARGO SPACE WITH WATER, (Stationary relative to the Ferry), NEED TO BE SATISFY: 34. Ease of change, repair or maintain

Coverage is defined as the extent to which the inventive principles from Table II encompass the inventive principles from Table IV. If weighted coverage is higher, it has been observed that the obtained solution is more likely to have the lowest cost and the maximum benefit-to-cost ratio.

Parameter to improve	Parameter to preserve	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
34. Ease of change, repair or maintain	33. Ease of operation	1	12 nT2	26	15
34. Ease of change, repair or maintain	39. Productivity	1	32 nT2	10	0
34. Ease of change, repair or maintain	38. Extent of automation/ autonomy	34	35	7	13 nT2
34. Ease of change, repair or maintain	34. Ease of change, repair or maintain	0	0	0	0

34. Ease of change, repair or maintain	32. Ease of achieving desired outcome	1	35	11	10
34. Ease of change, repair or maintain	20. Use of energy by stationary object	0	0	0	0
34. Ease of change, repair or maintain	27. Reliability	11	10	1	16 nT3
34. Ease of change, repair or maintain	35. Adaptability or versatility	7	1	4 nT3	16 nT3
34. Ease of change, repair or maintain	13. Stability	2	35	0	0
34. Ease of change, repair or maintain	16. Duration of action by stationary object	1	0	0	0

Inventive Principles (IP) selected for the Solution of relevant Contradictions between Needs to Satisfy

IP.1. Segmenting/ Integrating - strategic tpe

IP.12. Equipotentiality - tactical type

IP.26. Copying/ Replicating - strategic tpe

IP.15. Dynamics - strategic tpe

IP.32. Perception/ Appearance/ Color Changes - strategic tpe

IP.10. Preliminary Action - strategic tpe

IP.34. Discarding and Recovering - tactical type

IP.35. Transformation / Parameter Changes - strategic tpe

IP.7. Nesting/ Dispersing - tactical type

IP.13. Reverse or Indirect Action - strategic tpe

93.69 % weighted coverage of the inventive principles (IP) included in Table IV. of Contradictions between Needs to Satisfy (NS), in relation to the IP included in Table II Specific Contradiction Matrix.

The inventive principles labeled with nT2 are not found in Table II. Due to this condition, the first three contradictions in Table IV containing principles marked with nT2 are described as a Solution among Needs to Satisfy in Table IX. This solution, combined with the previously mentioned Base Solution, forms the Recommended Solution by the Aatrizinventor Algorithm, shown in Table V.

From practical experience, if Table IV contains more than 3 contradictions with inventive principles not included in Table II, then it is likely to be more challenging to construct a specific solution. In that case, it is recommended to look for an alternative combination of parameters in Table VI of sensitivity analysis. It is also an option to select another need to satisfy, which is shown in Table VII Essential Contradictions of Needs to Satisfy (NS) for the same undesirable effects already evaluated for CARGO SPACE WITH WATER, (Stationary relative to the Ferry).

To evaluate the recommended inventive principles here and the corresponding contradictions in which they participate, it is necessary for the Base Solution to guide an initial context for the solution, as the contradictions between Needs to Satisfy do not identify which variable of the evaluated object S1 should be operated.

Inventive principles labeled with nT3 are included in Table II, but do not participate in the Recommended

Solution shown in Table V. The Innovation Team must review the contradictions where they participate, to determine if there were other specific aspects that could be significant for the solution.

Unmarked inventive principles are included in Table II Specific Contradiction Matrix and in Table V Recommended Solution.

TABLE V. RECOMMENDED SOLUTION FOR INNOVATION CHALLENGE FOR EVALUATED OBJECT CARGO SPACE WITH WATER, (Stationary relative to the Ferry)

CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

Evaluated need to satisfy in this report: **34. Ease of change, repair or maintain**

UDEs: (+) 2. Heaviness of stationary object// (-) 29. Fulfillment of desired outcome// (+) 31. Object-generated harmful factors// (+) 35. Adaptability or versatility

Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(+) 2. Heaviness of stationary object	(-) 29. Fulfillment of desired outcome	Essential	wt.1	10 Es.	1 Es.	35 Es.	17 Es.
(+) 34. Ease of change, repair or maintain	(-) 29. Fulfillment of desired outcome	Compl. 1	wt.4	25	10 Es.	0	0
(+) 2. Heaviness of stationary object	(+) 31. Object-generated harmful factors	Compl. 2	wt.7	35 Es.	22	1 Es.	39
(+) 2. Heaviness of stationary object	(+) 34. Ease of change, repair or maintain	Compl. 3	wt.9	2	27	28	11
(+) 2. Heaviness of stationary object	(+) 35. Adaptability or versatility	Compl. 4	wt.12	19	15	29	0
34. Ease of change, repair or maintain	33. Ease of operation	NS.1	wns.1	1 Es.	12	26	15
34. Ease of change, repair or maintain	39. Productivity	NS.2	wns.2	1 Es.	32	10 Es.	0
34. Ease of change, repair or maintain	38. Extent of automation/ autonomy	NS.3	wns.3	34	35 Es.	7	13

Relevant inventive principles from Table II not included in Recommended Solution

Before deciding on the solution, make sure you have previously reviewed the contradictions with relevant Inventive Principles from Table II, not included in the Recommended Solution. The 3 most relevant are shown below.

IP.4. Asymmetry/ Symmetry (Pos.2) ***	IP. Oper.	[Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] - [Par.34][Par.35][IP(s) : 7,1,4,16] - [Par.35][Par.34][IP(s) : 1,16,7,4] -
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IP.16. Partial or Excessive Actions (Pos.14) ***	IP. Oper.	[Par.35][Par.2][IP(s) : 19,15,29,16] - [Par.34][Par.35][IP(s) : 7,1,4,16] - [Par.35][Par.34][IP(s) : 1,16,7,4] -
IP.9. Preliminary Anti-action (Pos.20) ***	IP. Oper.	[Par.29][Par.2][IP(s) : 28,35,27,9] -

Inventive Principles (IP) selected for Recommended Solution:

To develop a Specific Solution based on the contradictions provided in Table V, where S1: CARGO SPACE WITH WATER, (Stationary relative to the Ferry) interacts with S2: FERRY (stationary relative to the Cargo Space), the Innovation Team must analyze the recommended innovation concepts for each selected inventive principle listed below. At least one concept from each principle that is applicable to the challenge under evaluation should be chosen.

Once the concepts are selected per inventive principle, it is essential to conduct an 'integrated reading' of the contradictions indicated in Table V. If this 'integrated reading' can demonstrate a coherent logical thread for each selected contradiction and as a whole, then it can be considered that there is a potential innovation solution.

To complete the definition of the specific solution, it is necessary to review the relevant inventive principles from Table II that were not included in the Recommended Solution in Table V, which are presented above.

For more details on the selected contradictions, you can review the complete descriptions of the inventive principles by contradiction, as shown in Table IX.

In the Starting Manual, Fundamentals of Aatrizinventor, Point 11, an example is provided for developing the Specific Solution based on the Recommended Solution by the Aatrizinventor algorithm, based on the 'Language of Nature Innovation.' The identification of a specific solution is a systematic and iterative process involving multiple concepts, aiming to determine a comprehensive solution with minimal implementation costs and maximum benefit-to-cost ratio.

It's important noting that an asterisk (*) has been added to the name of the object under evaluation to remind that the descriptions of the inventive principles may consider that CARGO SPACE WITH WATER, (Stationary relative to the Ferry) can be in its current physical and functional state, or in a modified state, or even in a new state, as needed to achieve the desired objective. Please, make the most of your relational thinking skills.

Summary description of the Inventive Principles included in the Recommended Solution shown above, applicable to the challenge under evaluation for the defined space and time:

N°1 Improve: (+) 2. Heaviness of stationary object and Attenuate or Preserve: (-) 29. Fulfillment of desired outcome

IP.10. Preliminary Action - strategic type (1)

- a. Perform the required change in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, before it is needed (either fully or partially).
- b. Pre-arrange CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing

time for their delivery.

IP.1. Segmenting/ Integrating - strategic type (2)

- a. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different existing or new parts, forms, phases, states or conditions of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* in a single entity.
- c. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

IP.35. Transformation / Parameter Changes - strategic type (3)

- a. Change CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).
- b. Change the composition or condition of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* by adding or removing components.
- c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

IP.17. Another Dimension or Field - tactical type (4)

- a. Add or remove physical dimensions or fields of action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
- b. Move CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* to a new dimension in space or performance field.
- c. Use for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* multi-story arrangement of objects instead of a single-story arrangement.
- d. Tilt or re-orient CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*; lay it on its side.
- e. Use another side of a given dimension or field of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

N°2 Improve: (+) 34. Ease of change, repair or maintain and Attenuate or Preserve: (-) 29. Fulfillment of desired outcome

IP.25. Self-service - operative type (5)

- a. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* serve itself by performing helpful auxiliary functions.
- b. Use resources, energy or substances that are wasted or unused by CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
- c. Incorporate resources and/or functions into CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* for self-service during operation.

IP.10. Preliminary Action - strategic type (6)

- a. Perform the required change in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, before it is needed (either fully or partially).
- b. Pre-arrange CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

N°3 Improve: (+) 2. Heaviness of stationary object and Attenuate or Preserve: (+) 31. Object-generated harmful factors

IP.35. Transformation / Parameter Changes - strategic type (7)

- a. Change CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).
- b. Change the composition or condition of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* by adding or removing components.
- c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

IP.22. Convert harm in benefit - strategic type (8)

- a. Use harmful factors, or external effects related to harmful factors, for OBJECT S1 (particularly, effects of the environment or surroundings) to achieve a positive effect with CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
- b. Eliminate a harmful primary action by adding another action to CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, which counteracts the harmful action to solve the problem.
- c. Amplify a harmful factor or a part of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, to such a degree that it is no longer harmful.

IP.1. Segmenting/ Integrating - strategic type (9)

- a. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different existing or new parts, forms, phases, states or conditions of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* in a single entity.
- c. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

IP.39. Inert Atmosphere / Environment - operative type (10)

- a. Replace a currently harmful or undesirable environment for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* with an inert one, either fully or partially.
- b. Add neutral parts, or inert additives to OBJECT S1 or its environment.
- c. Leave the harmful environment for OBJECT S1 towards another environment or dimension.

N°4 Improve: (+) 2. Heaviness of stationary object and Attenuate or Preserve: (+) 34. Ease of change, repair or maintain

IP.2. Taking out/ Adding - strategic type (11)

- a. Separate an interfering part or a property from CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, or single out the only necessary part (or property) of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
- b. Add new parts or properties to CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

IP.27. Cheap Short-Living Objects - strategic type (12)

- a. Replace or divide (either fully or partially) CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or its action with multiple inexpensive or short-living objects, actions, or sub-parts, which compress or simplify its characteristics and properties, and/or are limited but sufficient to achieve the desired objective.
- b. Compress certain qualities of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

IP.28. Mechanics Substitution - strategic type (13)

- a. Replace a direct or manual action in, or for, CARGO SPACE WITH WATER, (Stationary relative to the

Ferry)*, with a mechanical action or a tool.

b. Replace a mechanical means in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.

c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

d. Change from static fields in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* to moving fields, from unstructured fields to those with structure, or vice versa.

e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

IP.11. Beforehand Cushioning - tactical type (14)

a. Prepare emergency means, beforehand, to compensate for the relatively low reliability of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

N°5 Improve: (+) 2. Heaviness of stationary object and Attenuate or Preserve: (+) 35. Adaptability or versatility

IP.19. Time-Varying Action/ Periodic or Pulsating - strategic type (15)

a. Instead of using continuous action in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, use time-varying, periodic, or pulsating actions.

b. If the action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* is already periodic, change the periodic magnitude or frequency.

c. Use pauses between impulses to perform a different action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

d. If the current action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* is time-varying, and if necessary, change to an action higher or lesser time-varying.

IP.15. Dynamics - strategic type (16)

a. Allow (or design) the characteristics of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into parts that are capable of relative movement between each other.

c. If CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or the process, use feature(s) or object(s) available in the nearby environment.

IP.29. Controllable Soft Variables - tactical type (17)

a. Use external, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological, etc.) to interact with CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* facilitating goal fulfillment of the function performed with Object S2.

b. Make easier CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* interact with Object S2 using internal, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological, etc.) available in S1 and / or S2, facilitating goal fulfillment.

N°6 Improve: 34. Ease of change, repair or maintain and Preserve: 33. Ease of operation

IP.1. Segmenting/ Integrating - strategic type (18)

- a. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different existing or new parts, forms, phases, states or conditions of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* in a single entity.
- c. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

IP.12. Equipotentiality - tactical type (19)

- a. In a potential field, limit position changes or energy variations of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
- b. Change operating conditions to eliminate the need to change the position or energy quality of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* in a potential field.

IP.26. Copying/ Replicating - strategic type (20)

- a. Instead of using CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, or any of its unavailable, expensive, fragile parts or properties, use simpler and inexpensive copies or replicates to perform the desired function and, if possible, do so with improved characteristics and properties, while disregarding the harmful, undesirable, or unnecessary ones.
- b. Imitate CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, or any of its parts or properties, leveraging the relevant available environment.
- c. If simple copies, or replicates are already being used, apply copies, or replicates of a higher level or technical

IP.15. Dynamics - strategic type (21)

- a. Allow (or design) the characteristics of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, external environment, or process to change to an optimal, or to find an optimal, operating condition.
- b. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into parts that are capable of relative movement between each other.
- c. If CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (or process) is rigid or inflexible, make it flexible or adaptive.
- d. To enhance the dynamics of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or the process, use feature(s) or object(s) available in the nearby environment.

N°7 Improve: 34. Ease of change, repair or maintain and Preserve: 39. Productivity

IP.1. Segmenting/ Integrating - strategic type (22)

- a. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different existing or new parts, forms, phases, states or conditions of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* in a single entity.
- c. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

IP.32. Perception/ Appearance/ Color Changes - strategic type (23)

- a. Change how is perceived, the appearance or shape of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* in relation to the object S2 with which it interacts.
- b. Change the color, or appearance, of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or

its external environment.

c. Change the transparency of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or its external environment.

IP.10. Preliminary Action - strategic type (24)

a. Perform the required change in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, before it is needed (either fully or partially).

b. Pre-arrange CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

N°8 Improve: 34. Ease of change, repair or maintain and Preserve: 38. Extent of automation/ autonomy

IP.34. Discarding and Recovering - tactical type (25)

a. Make portions of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, which have fulfilled their functions or are unnecessary, go away (discard by absorption, dissolving, evaporating, etc.).

b. Conversely, restore consumable parts of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* directly in operation.

IP.35. Transformation / Parameter Changes - strategic type (26)

a. Change CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).

b. Change the composition or condition of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* by adding or removing components.

c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

IP.7. Nesting/ Dispersing - tactical type (27)

a. Place CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* fully or partially inside another object; place each object, in turn, fully or partially inside the other.

b. Make one part of OBJECT S1 pass through a cavity in the other, or vice versa.

c. If CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* is nested with another object, and if necessary, apply a dispersing action.

IP.13. Reverse or Indirect Action - strategic type (28)

a. Inverse the applied action or apply an indirect action to perform the current function of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* to interact with object S2 It should be identified how CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* currently performs an action with Object S2 and from there evaluate an inverse or indirect action.

b. Make moving parts of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (or the external environment) fixed, and fixed parts moving.

c. Turn CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (or process) 'upside down', 'change the position', 'change the condition'.

Relevant inventive principles from Table II not included in Recommended Solution

IP.4. Asymmetry/ Symmetry (Pos.(2) - operative type (29)

a. Change the shape of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* from symmetrical to asymmetrical, permanent, or variable in time, or vice versa.

b. If CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* is asymmetrical, increase its degree of asymmetry, or vice versa.

IP.16. Partial or Excessive Actions (Pos.(14) - operative type (30)

a. If the objective of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* in its interaction with FERRY (stationary relative to the Cargo Space) is difficult to fully achieve using a given solution, then use 'a little less' or 'a little more' of the same solution.

(Pos.) (31)

TABLE VI. RESULTS OF SENSITIVITY ANALYSIS FOR THE EVALUATED OBJECT CARGO SPACE WITH WATER, (Stationary relative to the Ferry)

CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

Coverage obtained for the current evaluation to compare with sensitivity analysis

Order	Par.1	Par.2	Par.3	Par.4	Par.5	Cob. NS (%)	Cob. EC (%)	Cob. GL (%)
#	2	29	31	35	34. Ease of change, repair or maintain	93.69	100	95.27

Table VI presents the 10 most favorable parameter combinations recommended by the Aatrizinventor algorithm. It is suggested to evaluate the 2 or 3 most relevant ones. Practice teaches that they often contain the best solution for the evaluated challenge.

(E) Combination of TRIZ innovation parameters evaluated in this Aatrizinventor Solution is prioritized here

(U) Combination of TRIZ innovation parameters shows a match only in the evaluated undesirable effects.

A. PRIORITISED CONTRADICTIONS BY GLOBAL COVERAGE (Cob.GL)

Par.5 is automatically selected

Order	Par.1	Par.2	Par.3	Par.4	Par.5	Cob. NS (%)	Cob. EC (%)	Cob. GL (%)
I.a	2	29	31	35	34. Ease of change, repair or maintain (E)	93.69	100	95.27
II.a	2	24	29	31	20. Use of energy by stationary object	93.4	100	95.05
III.a	2	8	29	31	20. Use of energy by stationary object	91.5	100	93.63
IV.a	2	12	29	31	16. Duration of action by stationary object	89.56	100	92.17

V.a	2	29	31	35	20. Use of energy by stationary object (U)	93.4	86.26	91.61
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B. PRIORITIZATION OF CONTRADICTIONS BY COVERAGE OF NEEDS TO SATISFY (Cob.NS)

Par.5 is automatically selected

Order	Par.1	Par.2	Par.3	Par.4	Par.5	Cob. NS (%)	Cob. EC (%)	Cob. GL (%)	Table VI.A
I.b	2	29	31	35	34. Ease of change, repair or maintain (E)	93.69	100	95.27	I.a
II.b	2	24	29	31	20. Use of energy by stationary object	93.4	100	95.05	II.a
III.b	2	29	31	35	20. Use of energy by stationary object (U)	93.4	86.26	91.61	V.a
IV.b	2	8	31	35	20. Use of energy by stationary object	93.4	68.55	87.19	-
V.b	2	12	29	31	20. Use of energy by stationary object	93.4	50.8	82.75	-

TABLE VII ESSENTIAL CONTRADICTIONS MATRIX FOR NEEDS TO SATISFY (NS) FOR THE SAME UNDESIRABLE EFFECTS EVALUATED OF: CARGO SPACE WITH WATER, (Stationary relative to the Ferry)

CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

Evaluated need to satisfy in this report: **34. Ease of change, repair or maintain**

UDEs: (+) 2. Heaviness of stationary object// (-) 29. Fulfillment of desired outcome// (+) 31. Object-generated harmful factors// (+) 35. Adaptability or versatility

This table allows the Innovation Team to compare the coverages obtained for the evaluated need to satisfy with those of the other defined needs, for the same undesirable effects. This way, they can decide whether to choose any of the suggested innovation parameter combinations here that offer better coverage.

Need to Satisfy	Parameter to improve	Parameter to attenuate or preserve	Contradict. Essential	Cob. NS (%)	Cob. between EC (%)	Cob. GL (%) 3/1
34. Ease of change, repair or maintain	(+) 2. Heaviness of stationary object	(-) 29. Fulfillment of desired outcome	[10,1,35,17]	93.69	100	95.27
20. Use of energy by stationary object	(+) 2. Heaviness of stationary object	(+) 20. Use of energy by stationary object	[18,19,28,1]	93.4	86.26	91.61

27. Reliability	(+) 2. Heaviness of stationary object	(-) 29. Fulfillment of desired outcome	[10,1,35,17]	86.19	100	89.64
32. Ease of achieving desired outcome	(+) 2. Heaviness of stationary object	(-) 29. Fulfillment of desired outcome	[10,1,35,17]	80.88	100	85.66
13. Stability	(+) 2. Heaviness of stationary object	(-) 29. Fulfillment of desired outcome	[10,1,35,17]	77.96	100	83.47
35. Adaptability or versatility	(+) 2. Heaviness of stationary object	(-) 29. Fulfillment of desired outcome	[10,1,35,17]	76.39	100	82.29
33. Ease of operation	(+) 2. Heaviness of stationary object	(-) 29. Fulfillment of desired outcome	[10,1,35,17]	75.58	100	81.68
38. Extent of automation/ autonomy	(+) 38. Extent of automation/ autonomy	(+) 2. Heaviness of stationary object	[28,26,35,10]	72.12	89.44	76.45
39. Productivity	(+) 2. Heaviness of stationary object	(+) 39. Productivity	[1,28,15,35]	77.94	34.72	67.14
16. Duration of action by stationary object	(+) 2. Heaviness of stationary object	(+) 16. Duration of action by stationary object	[2,27,19,6]	85.69	10.24	66.82

Table VII shows the essential contradictions obtained for each of the defined Needs to Satisfy, taking into account the same undesirable effects that have been evaluated. This table is based on the calculation of a global coverage (Cob.GL), which is determined by combining two values: the coverage from Table IV (Cob.NS) already explained, and a relative coverage (Cob. between EC) that is obtained in this table VII, when each other comparing the essential contradictions identified for the 10 parameters of Needs to Satisfy.

This global coverage (GL) is based on expert weighting criteria to prioritize the solutions for the different Needs to Satisfy. Experience with aatrizinventor indicates that the most effective solutions are those with higher global coverage, preferably exceeding 90%, if possible.

The Innovation Team may decide if it is appropriate to carry out a new evaluation with another Need to Satisfy, selected from the results provided in Table VII. This decision will be primarily made when the evaluated Need to Satisfy is not ranked in the first position of Table VII. In this table, the position of the evaluated Need to Satisfy is highlighted: 34. Ease of change, repair or maintain.

TABLE VIII. ORDER OF INCIDENCE OF INVENTIVE PRINCIPLES (POS.n)

CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

Participation analysis of inventive principles in TABLE II SPECIFIC CONTRADICTION MATRIX.

Evaluated parameters for Object CARGO SPACE WITH WATER, (Stationary relative to the Ferry):

Par. UDEs:

(+) 2. Heaviness of stationary object

- (-) 29. Fulfillment of desired outcome
 (+) 31. Object-generated harmful factors
 (+) 35. Adaptability or versatility
 Par. NS: (+) 34. Ease of change, repair or maintain

***: Inventive Principles from the Specific Contradiction Matrix (Table II) not described in the Recommend Solution (Table IX). It is recommended to perform an additional review following the order of position.

Inventive principles of Table II	IP type	Tables	Contradictions
IP.35. Transformation / Parameter Changes (Pos.1)	IP. Str.	II / III / IV	[Par.29][Par.2][IP(s) : 28,35,27,9] - [Par.31][Par.2][IP(s) : 35,22,1,39] - [Par.34][Par.2][IP(s) : 2,27,35,11] - [Par.2][Par.29][IP(s) : 10,1,35,17] - [Par.2][Par.31][IP(s) : 35,22,1,39] -
IP.4. Asymmetry/ Symmetry (Pos.2) ***	IP. Oper.	II / IV	[Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] - [Par.34][Par.35][IP(s) : 7,1,4,16] - [Par.35][Par.34][IP(s) : 1,16,7,4] -
IP.25. Self-service (Pos.3)	IP. Oper.	II / III /	[Par.34][Par.29][IP(s) : 25,10,0,0] - [Par.29][Par.34][IP(s) : 25,10,0,0] -
IP.19. Time-Varying Action/ Periodic or Pulsating (Pos.4)	IP. Str.	II / III /	[Par.35][Par.2][IP(s) : 19,15,29,16] - [Par.2][Par.35][IP(s) : 19,15,29,0] -
IP.2. Taking out/ Adding (Pos.5)	IP. Str.	II / III / IV	[Par.34][Par.2][IP(s) : 2,27,35,11] - [Par.2][Par.34][IP(s) : 2,27,28,11] -
IP.1. Segmenting/ Integrating (Pos.6)	IP. Str.	II / III / IV	[Par.31][Par.2][IP(s) : 35,22,1,39] - [Par.2][Par.29][IP(s) : 10,1,35,17] - [Par.2][Par.31][IP(s) : 35,22,1,39] - [Par.34][Par.35][IP(s) : 7,1,4,16] - [Par.35][Par.34][IP(s) : 1,16,7,4] -
IP.10. Preliminary Action (Pos.7)	IP. Str.	II / III / IV	[Par.2][Par.29][IP(s) : 10,1,35,17] - [Par.34][Par.29][IP(s) : 25,10,0,0] - [Par.29][Par.34][IP(s) : 25,10,0,0] -
IP.28. Mechanics Substitution (Pos.8)	IP. Str.	II / III /	[Par.29][Par.2][IP(s) : 28,35,27,9] - [Par.2][Par.34][IP(s) : 2,27,28,11] -
IP.7. Nesting/ Dispersing (Pos.9)	IP. Tac.	II / IV	[Par.34][Par.35][IP(s) : 7,1,4,16] - [Par.35][Par.34][IP(s) : 1,16,7,4] -
IP.27. Cheap Short-Living Objects (Pos.10)	IP. Str.	II / III /	[Par.29][Par.2][IP(s) : 28,35,27,9] - [Par.34][Par.2][IP(s) : 2,27,35,11] - [Par.2][Par.34][IP(s) : 2,27,28,11] -
IP.17. Another Dimension or Field (Pos.11)	IP. Tac.	II / III /	[Par.2][Par.29][IP(s) : 10,1,35,17] - [Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] -

IP.22. Convert harm in benefit (Pos.12)	IP. Str.	II / III /	[Par.31][Par.2][IP(s) : 35,22,1,39] - [Par.2][Par.31][IP(s) : 35,22,1,39] -
IP.15. Dynamics (Pos.13)	IP. Str.	II / III / IV	[Par.35][Par.2][IP(s) : 19,15,29,16] - [Par.2][Par.35][IP(s) : 19,15,29,0] -
IP.16. Partial or Excessive Actions (Pos.14) ***	IP. Oper.	II / IV	[Par.35][Par.2][IP(s) : 19,15,29,16] - [Par.34][Par.35][IP(s) : 7,1,4,16] - [Par.35][Par.34][IP(s) : 1,16,7,4] -
IP.34. Discarding and Recovering (Pos.15)	IP. Tac.	II / IV	[Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] -
IP.29. Controllable Soft Variables (Pos.16)	IP. Tac.	II / III /	[Par.35][Par.2][IP(s) : 19,15,29,16] - [Par.2][Par.35][IP(s) : 19,15,29,0] -
IP.39. Inert Atmosphere / Environment (Pos.17)	IP. Oper.	II / III /	[Par.31][Par.2][IP(s) : 35,22,1,39] - [Par.2][Par.31][IP(s) : 35,22,1,39] -
IP.26. Copying/ Replicating (Pos.18)	IP. Str.	II / IV	[Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] -
IP.11. Beforehand Cushioning (Pos.19)	IP. Tac.	II / III / IV	[Par.34][Par.2][IP(s) : 2,27,35,11] - [Par.2][Par.34][IP(s) : 2,27,28,11] -
IP.9. Preliminary Anti-action (Pos.20) ***	IP. Oper.	II /	[Par.29][Par.2][IP(s) : 28,35,27,9] -

TABLE IX. RECOMMENDED SOLUTION ACCORDING TO THE MOST RELEVANT CONTRADICTIONS IDENTIFIED FOR THE EVALUATED OBJECT: CARGO SPACE WITH WATER, (Stationary relative to the Ferry)

CHALLENGE: Improve Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch

This table displays the relevant contradictions identified by the algorithm, which are crucial for determining the direction and scope of the solution to the innovation challenge under evaluation. The specific solution will be obtained by applying the updated inventive principles detailed below.

It is essential to bear in mind that we are evaluating CARGO SPACE WITH WATER, (Stationary relative to the Ferry) when it interacts with FERRY (stationary relative to the Cargo Space) and there is an affected function: Ferry stability affected by water entering the cargo space due to the breakage of the locking pin of the cargo space inspection hatch, in a specific space and time. CARGO SPACE WITH WATER, (Stationary relative to the Ferry) may require changes in space, time, its physical composition, or its functional characteristic, as well as partial or total replacement with another object or other recommended changes. To emphasize this concept, we mark CARGO SPACE WITH WATER, (Stationary relative to the Ferry) with an asterisk. Do not read the name of the evaluated object literally; associate it with a possible solution for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Each inventive principle described here may contain more than one innovation concept recommended by

TRIZ, identified as a, b, c, ..., not all of which are applicable to a specific case under evaluation. The Innovation Team must select those innovation concepts that best relate to the evaluated innovation challenge, based on their own knowledge and the analysis of relational thinking that they must carry out.

Additionally, technological research may be necessary for its solution, as the specific solution recommended by the inventive principles described here likely already exists somewhere in the world. The interpretation of the inventive principles, to apply them specifically to the evaluated case, is a recursive process that generally ranges from strategic to tactical and operational levels. We recommend completing the reading of the inventive principles described below to envision a possible solution and then rereading the principles to reinforce the coherence of the emerging solution. As a result of the finally determined innovation solution, there will be a change in CARGO SPACE WITH WATER, (Stationary relative to the Ferry), in a new context guided by the inventive principles, probably not previously imagined.

The Language of Nature's Innovation provides speed and focus for guided and systematic innovation thinking for individuals. The foundation for innovation is a profound understanding of the current situation.

IX.A BASE SOLUTION FOR INNOVATION CHALLENGE FOR THE EVALUATED OBJECT CARGO SPACE WITH WATER, (Stationary relative to the Ferry) NEED TO SATISFY: 34. Ease of change, repair or maintain

Strategic inventive principles: Str. IP

Tactical inventive principles: Tac. IP

Operative inventive principles: Oper. IP

Pos.n : Order of importance n of an inventive principle included in Table II.

ESSENTIAL CONTRADICTION

Contradiction order wt.1

Parameter to improve: (+) 2. Heaviness of stationary object

TO IMPROVE (UDE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

Parameter to attenuate or preserve: (-) 29. Fulfillment of desired outcome

TO ATTENUATE OR PRESERVE (UDE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has Less Achievement of desired outcome interacting with S2

Inventive principles IP(s) : [10,1,35,17]

10. Preliminary Action, Str. IP (Pos.7):

a. Perform the required change in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, before it is needed (either fully or partially).

b. Pre-arrange CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in time

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance

1. Segmenting/ Integrating, Str. IP (Pos.6):

- a. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different parts, shapes, phases, states, or existing or new conditions of a CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into a single entity..
- c. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in space / Separation in subsystem

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

35. Transformation/ Parameter Changes, Str. IP (Pos.1):

- a. Change CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).
- b. Change the composition or condition of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* by adding or removing components.
- c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation by condition / Separation alternative

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

17. Another Dimension or Field, Tac. IP (Pos.11):

- a. Add or remove physical dimensions or fields of action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
- b. Move CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* to a new dimension in space or performance field.
- c. Use for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* multi-story arrangement of objects instead of a single-story arrangement.
- d. Tilt or re-orient CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*; lay it on its side.
- e. Use another side of a given dimension or field of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in space

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

COMPLEMENTARY CONTRADICTION 1

Contradiction order wt.4

Parameter to improve: (+) 34. Ease of change, repair or maintain

TO IMPROVE (DE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has More Desired ease of change, repair or maintenance to interact with S2

Parameter to attenuate or preserve: (-) 29. Fulfillment of desired outcome

TO ATTENUATE OR PRESERVE (UDE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has Less Achievement of desired outcome interacting with S2

Inventive principles IP(s) : [25,10,0,0]

25. Self-service, Oper. IP (Pos.3):

- a. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* serve itself by performing helpful auxiliary functions.
- b. Use resources, energy or substances that are wasted or unused by CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
- c. Incorporate resources and/or functions into CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* for self-service during operation.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in subsystem / Separation alternative

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

10. Preliminary Action, Str. IP (Pos.7):

- a. Perform the required change in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, before it is needed (either fully or partially).
- b. Pre-arrange CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in time

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance

COMPLEMENTARY CONTRADICTION 2

Contradiction order wt.7

Parameter to improve: (+) 2. Heaviness of stationary object

TO IMPROVE (UDE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

Parameter to attenuate or preserve: (+) 31. Object-generated harmful factors

TO ATTENUATE OR PRESERVE (UDE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has More Harmful factors affecting S2 by mutual interaction

Inventive principles IP(s) : [35,22,1,39]

35. Transformation/ Parameter Changes, Str. IP (Pos.1):

- a. Change CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).

b. Change the composition or condition of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* by adding or removing components.

c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation by condition / Separation alternative

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

22. Blessing in Disguise, Str. IP (Pos.12):

a. Use harmful factors, or external effects related to harmful factors, for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (particularly, effects of the environment or surroundings) to achieve a positive effect with CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

b. Eliminate a harmful primary action by adding another action to CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, which counteracts the harmful action to solve the problem.

c. Amplify a harmful factor or a part of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, to such a degree that it is no longer harmful.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Integration in supersystem

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

1. Segmenting/ Integrating, Str. IP (Pos.6):

a. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into existing and/or new parts, shapes, phases, states, or conditions.

b. Integrate different parts, shapes, phases, states, or existing or new conditions of a CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into a single entity..

c. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in space / Separation in subsystem

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

39. Inert Atmosphere/ Environment, Oper. IP (Pos.17):

a. Replace a currently harmful or undesirable environment for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* with an inert one, either fully or partially.

b. Add neutral parts, or inert additives to CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or its environment.

c. Leave the harmful environment for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* towards another environment or dimension.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation by condition

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving if a solution has not yet emerged

COMPLEMENTARY CONTRADICTION 3

Contradiction order wt.9

Parameter to improve: (+) 2. Heaviness of stationary object

TO IMPROVE (UDE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

Parameter to attenuate or preserve: (+) 34. Ease of change, repair or maintain

TO PRESERVE (DE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has More Desired ease of change, repair or maintenance to interact with S2

Inventive principles IP(s) : [2,27,28,11]

2. Taking Out/ Adding, Str. IP (Pos.5):

- a. Separate an interfering part or a property from CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, or single out the only necessary part (or property) of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
 - b. Add new parts or properties to CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
- Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in space

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes

27. Cheap Short-Living Objects, Str. IP (Pos.10):

- a. Replace or divide (either fully or partially) CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or its action with multiple inexpensive or short-living objects, actions, or sub-parts, which compress or simplify its characteristics and properties, and/or are limited but sufficient to achieve the desired objective.
- b. Comprising certain qualities of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in subsystem

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

28. Mechanics Substitution, Str. IP (Pos.8):

- a. Replace a direct or manual action in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.
- c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
- d. Change from static fields in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* to moving fields, from unstructured fields to those with structure, or vice versa.
- e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and

ferromagnetic particles) in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.
Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation by condition

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes

11. Beforehand Cushioning, Tac. IP (Pos.19):

a. Prepare emergency means, beforehand, to compensate for the relatively low reliability of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in time

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

COMPLEMENTARY CONTRADICTION 4

Contradiction order wt.12

Parameter to improve: (+) 2. Heaviness of stationary object

TO IMPROVE (UDE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

Parameter to attenuate or preserve: (+) 35. Adaptability or versatility

TO ATTENUATE OR PRESERVE (UDE): CARGO SPACE WITH WATER, (Stationary relative to the Ferry) has More Adaptability or versatility to interaction variability of S2

Inventive principles IP(s) : [19,15,29,0]

19. Time-Varying Action/ Periodic or Pulsating, Str. IP (Pos.4):

a. Instead of using continuous action in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, , use time-varying, periodic, or pulsating actions.

b. If the action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* is already periodic, change the periodic magnitude or frequency.

c. Use pauses between impulses to perform a different action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

d. If the current action of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* is time-varying, and if necessary, change to an action higher or lesser time-varying.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in time

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving performance

15. Dynamics, Str. IP (Pos.13):

a. Allow (or design) the characteristics of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into parts that are capable of relative movement between each other.

c. If CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or the

process, use feature(s) or object(s) available in the nearby environment.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in time

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

29. Controllable Soft Variables, Tac. IP (Pos.16):

a. Use external, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological , etc.) to interact with CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* facilitating goal fulfillment of the function performed with S2 Object.

b. Make easier CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* interact with S2 Object using internal, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological , etc.) available in S1 and / or S2, facilitating goal fulfillment.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in time

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving if a solution has not yet emerged

IX.B SOLUTION TO MORE RELEVANT CONTRADICTIONS BETWEEN NEEDS TO SATISFY (Cob.NS)

Included in each inventive principle described below is the incidence level or position number it occupies in Table II. If it is not shown, it means that it only appears in Table IV. and requires attention.

CONTRADICTION BETWEEN NEEDS TO SATISFY N° 1

Parameter to improve 34. Ease of change, repair or maintain

MEJORAR > CARGO SPACE WITH WATER, (Stationary relative to the Ferry) tiene More Desired ease of change, repair or maintenance to interact with S2

Parameter to preserve 33. Ease of operation

PRESERVAR > CARGO SPACE WITH WATER, (Stationary relative to the Ferry) tiene más efecto deseable por párametro 33. Ease of operation

Inventive principles IP(s) : [1,12,26,15]

1. Segmenting/ Integrating, Str. IP (Pos.6):

a. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into existing and/or new parts, shapes, phases, states, or conditions.

b. Integrate different parts, shapes, phases, states, or existing or new conditions of a CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into a single entity..

c. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in space / Separation in subsystem

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

12.- Equipotentiality, Tac. IP (Pos.):

a. In a potential field, limit position changes or energy variations of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

b. Change operating conditions to eliminate the need to change the position or energy quality of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* in a potential field.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation by condition to satisfy contradiction

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving if a solution has not yet emerged

26. Copying/ Replicating, Str. IP (Pos.18):

a. Instead of using CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, or any of its unavailable, expensive, fragile parts or properties, use simpler and inexpensive copies or replicates to perform the desired function and, if possible, do so with improved characteristics and properties, while disregarding the harmful, undesirable, or unnecessary ones.

b. Imitate or replicate CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, or any of its parts or properties, leveraging the relevant available environment.

c. If simple copies, or replicates are already being used, apply copies, or replicates of a higher level or technical complexity.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in space

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving if a solution has not yet emerged

15. Dynamics, Str. IP (Pos.13):

a. Allow (or design) the characteristics of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into parts that are capable of relative movement between each other.

c. If CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or the process, use feature(s) or object(s) available in the nearby environment.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in time

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

CONTRADICTION BETWEEN NEEDS TO SATISFY N° 2

Parameter to improve 34. Ease of change, repair or maintain

MEJORAR > CARGO SPACE WITH WATER, (Stationary relative to the Ferry) tiene More Desired ease of change, repair or maintenance to interact with S2

Parameter to preserve 39. Productivity

PRESERVAR > CARGO SPACE WITH WATER, (Stationary relative to the Ferry) tiene más efecto deseable por párametro 39. Productivity

Inventive principles IP(s) : [1,32,10,0]

1. Segmenting/ Integrating, Str. IP (Pos.6):

a. Divide CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into existing and/or new parts, shapes, phases, states, or conditions.

b. Integrate different parts, shapes, phases, states, or existing or new conditions of a CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* into a single entity..

c. Make CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in space / Separation in subsystem

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

32. Perception/ Appearance/ Color Changes, Str. IP (Pos.):

a. Change how is perceived, the appearance or shape of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* in relation to the object (S2) with which it interacts.

b. Change the color, or appearance, of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or its external environment.

c. Change the transparency of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* or its external environment.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation by condition

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving if a solution has not yet emerged

10. Preliminary Action, Str. IP (Pos.7):

a. Perform the required change in, or for, CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*, before it is needed (either fully or partially).

b. Pre-arrange CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in time

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving performance

CONTRADICTION BETWEEN NEEDS TO SATISFY N° 3

Parameter to improve 34. Ease of change, repair or maintain

MEJORAR > CARGO SPACE WITH WATER, (Stationary relative to the Ferry) tiene More Desired ease of change, repair or maintenance to interact with S2

Parameter to preserve 38. Extent of automation/ autonomy

PRESERVAR > CARGO SPACE WITH WATER, (Stationary relative to the Ferry) tiene más efecto deseable por párametro 38. Extent of automation/ autonomy

Inventive principles IP(s) : [34,35,7,13]

34. Discarding and Recovering, Tac. IP (Pos.15):

- a. Make portions of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* , which have fulfilled their functions or are unnecessary, go away (discard by absorption, dissolving, evaporating, etc.).
- b. Conversely, restore consumable parts of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* directly in operation.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in time

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving if a solution has not yet emerged

35. Transformation/ Parameter Changes, Str. IP (Pos.1):

- a. Change CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).
- b. Change the composition or condition of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* by adding or removing components.
- c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)*.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation by condition / Separation alternative

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

7. Nesting/ Dispersing, Tac. IP (Pos.9):

- a. Place CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* fully or partially inside another object; place each object, in turn, fully or partially inside the other.
- b. Make one part of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* pass through a cavity in the other, or vice versa.
- c. If CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* is nested with another object, and if necessary, apply a dispersing action.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in space / Separation in subsystem

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving attributes

13. Inverse or Indirect Action, Str. IP (Pos.):

- a. Inverse the applied action or apply an indirect action to perform the current function of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* to interact with object (S2)

It should be identified how CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* currently performs an action with S2 Object and from there evaluate an inverse or indirect action.

- b. Make moving parts of CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (or the external environment) fixed, and fixed parts moving.
- c. Turn CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* (or process) “upside down”, “change the position”, “change the condition”.

Separation principle for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Separation in space / Separation inverse

Solution strategy for CARGO SPACE WITH WATER, (Stationary relative to the Ferry)* : Improving

attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

Anexo

List of applicable Inventive Principles for Innovation Solutions

IP.1. Segmenting/ Integrating	IP.21. Skipping/ Avoiding
IP.2. Taking out/ Adding	IP.22. Convert harm in benefit
IP.3. Local Quality	IP.23. Feedback
IP.4. Asymmetry/ Symmetry	IP.24. Intermediary
IP.5. Merging/ Separating	IP.25. Self-service
IP.6. Universality	IP.26. Copying/ Replicating
IP.7. Nesting/ Dispersing	IP.27. Cheap Short-Living Objects
IP.8. Anti-Weight/ Compensation	IP.28. Mechanics Substitution
IP.9. Preliminary Anti-action	IP.29. Controllable Soft Variables
IP.10. Preliminary Action	IP.30. Simple Shapes/ Ways to Interact
IP.11. Beforehand Cushioning	IP.31. 31.Using/ Removing Unused Parts
IP.12. Equipotentiality	IP.32. Perception/ Appearance/ Color Changes
IP.13. Reverse or Indirect Action	IP.33. Homogeneity / Compatibility
IP.14. Spheroidality - Curvature - Angle	IP.34. Discarding and Recovering
IP.15. Dynamics	P.35. Transformation / Parameter Changes
IP.16. Partial or Excessive Actions	IP.36. Phase, State or Condition Transitions
IP.17. Another Dimension or Field	IP.37. Useful Perceptible Change
IP.18. Mechanical Vibrations/ Energy Variations	IP.38. Strong or Quick Reactions
IP.19. Time-Varying Action/ Periodic or Pulsating	IP.39. Inert Atmosphere / Environment
IP.20. Continuity of Useful Action	IP.40. Composite Materials/ Conditions

Available Aatrizinventor solutions: 0 - You can get more solutions in home page link.

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