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(54) Title: TRANSPORTABLE FLIGHT SIMULATOR

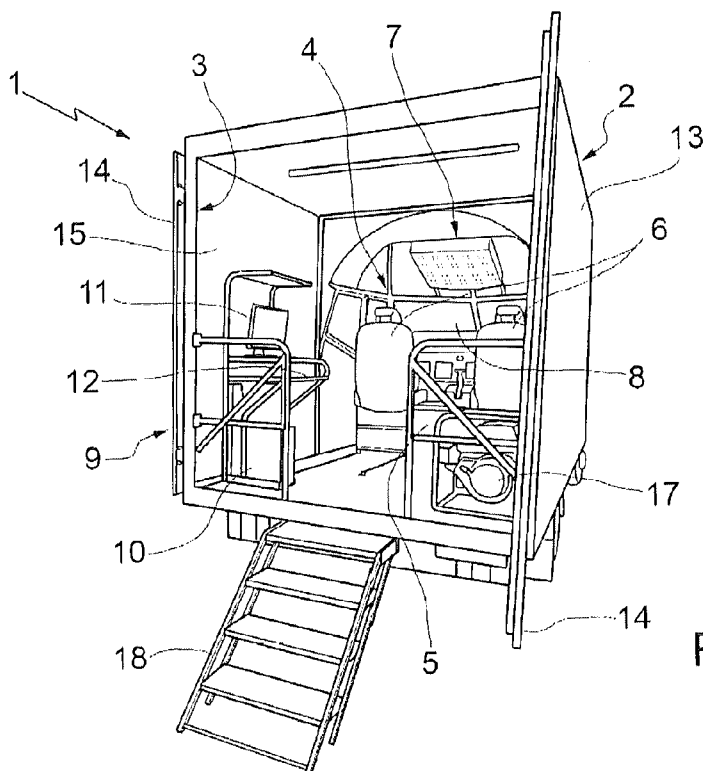


FIG.2

(57) Abstract: A flight simulator (1) comprises an external structure (2) defining a space (3), the space (3) comprising at least one pilot station (4) provided with control devices, with at least one seat (6), with an on-board instrumentation (7), and with at least one screen (8) for displaying images, data processing devices (5) serving for the operation of the flight simulator (1), wherein the external structure (2) is associable with movement means, in order to facilitate the transport and the movement of the flight simulator (1) without territorial limits.



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"TRANSPORTABLE FLIGHT SIMULATOR"

TECHNICAL FIELD OF THE INVENTION

The present invention refers to a transportable
5 flight simulator. In particular, the present
invention refers to a professional flight simulator
that is easily movable and/or transportable.

STATE OF THE PRIOR ART

Known in the aeronautical field is the use of flight
10 simulators, adapted to simulate the use conditions
of an aircraft, in order to allow an aspiring user
and/or a user - pilot - to acquire the
instrumentation technique or a greater mastery and
confidence with the controls, the instrumentation,
15 the maneuvers and the procedures to be executed
during the various flight steps.

Such simulators generally comprise one or more
control devices, and a display system adapted to
simulate the virtual environment in which the
20 aircraft is moved, and at least one data processing
system.

The flight simulators can have different
configurations and characteristics as a function of
the degree of simulation realism that one wishes to
25 obtain.

In the simplest configurations, the flight simulators can comprise a control station, a video terminal, one or more control devices, such as a keyboard, a control stick, etc., and a data
5 processing unit suitable for processing the signals coming from the control devices and to manage the displayed images as well as the data reported by the on-board instrumentation, if provided.

In the configurations of professional type, used for
10 example in training professional pilots, a flight simulator can comprise the complete on-board instrumentation of an aircraft and, possibly, be connected to an inertial platform adapted to simulate the movements to which the pilot cabin is
15 normally subjected during the various flight steps.

The latter type of flight simulators thus allows simulating, in an extremely realistic manner, the conditions and stresses to which an aircraft is subjected during the various flight steps.

20 However, such simulators have as disadvantage the fact they cannot be transported and/or moved, given that they are installed in a permanent manner and/or adapted for fixed positions in suitable areas provided for their use, for example at an airport
25 flight school since they are mainly and/or

exclusively intended for aspiring airline pilots.

The presence of possible inertial platforms, constrained fixed to the ground, along with the overall bulk of the simulator structure comprising the pilot station and all the devices necessary for
5 the operation thereof, prevents removing and/or transporting the aforesaid flight simulator if it is necessary to move the location thereof.

If such professional simulators are installed in
10 private structures, at airline company offices or in military structures, they are not actually accessible or easily usable by anyone who requires training in order to attain licenses or flight qualifications.

15 There is therefore the need to improve the state of the prior art with particular reference to the possibility of moving, and hence making more easily usable for a wide array of users, a "so-called" flight simulator of professional type constituted by
20 a no-longer-used pilot cabin of airplanes, helicopters or the like, for normal flight service, or alternatively by a perfectly equivalent cabin reconstructed with original essential components.

In particular, there is the need to facilitate and
25 simplify the transportability/movement of a

professional flight simulator, so as to be able to transport this, if necessary or pre-established.

OBJECTS OF THE INVENTION

One object of the present invention is to improve
5 the state of the prior art.

Another object of the present invention is to provide a flight simulator, of professional type, that is easily movable for the purpose of being able to easily transport it where required.

10 A further object of the present invention is to provide a flight simulator, of professional type, capable of simulating the aircraft flight steps in a very similar and realistic manner.

A further object of the present invention is to
15 provide a flight simulator that accurately reproduces the pilot station and possibly the nacelle of the simulated aircraft.

A further object of the present invention is to provide a flight simulator, of professional type,
20 that can function autonomously even in the absence of an electrical power supply network.

In accordance with one aspect of the present invention, a flight simulator is provided according to claim 1.

25 In accordance with a further aspect of the present

invention, a movable wheel-type vehicle is provided comprising the aforesaid flight simulator, according to claim 16.

The dependent claims refer to preferred and
5 advantageous embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the present invention will be more evident from the detailed description of a preferred but not
10 exclusive embodiment of a transportable flight simulator, illustrated as a non-limiting example in the enclosed set of drawings in which:

figure 1 is a rear perspective view of a flight simulator according to the present invention;

15 figure 2 is a rear perspective view of a flight simulator pursuant to figure 1;

figure 3 is a rear view of the entire pilot station of a transportable flight simulator pursuant to figure 1;

20 figure 4 is a perspective view of a further embodiment of a transportable flight simulator according to the present invention.

EMBODIMENTS OF THE INVENTION

With reference to the enclosed figures, a
25 transportable flight simulator according to the

present invention is indicated overall with 1.

Hereinbelow, with the term flight simulator it is intended to indicate a flight simulator of professional type, i.e. capable of accurately reproducing the interior of the pilot cabin - the cockpit - complete with the on-board instrumentation and controls of an aircraft that one wishes to simulate.

According to a further aspect of the present invention, the space where the pilot cabin is located can be shaped in order to accurately simulate the interior and/or exterior of the fuselage of an aircraft or of a portion thereof, such an airplane, a helicopter or the like.

The flight simulator 1 thus shaped allows the pilot to acquire high confidence and mastery not only with the controls of the simulated aircraft, but also with the internal and external dimensions thereof.

According to the present invention, variants of the flight simulator 1 are provided, suitable for reproducing the cockpit of different types of aircraft such as, as a non-limiting example, airline carriers, small-size recreational airplanes, military aircraft, helicopters, gliders, etc.

Inside the flight simulator 1, the on-board

instrumentation and controls are present corresponding to those that actually equip the simulated aircraft model.

In such a manner, inside the flight simulator 1, it is possible to accurately recreate the environment of an actual control cabin, with particular reference to the flight instruments, thus giving the pilot the impression of being on board an actual aircraft and not a simulator.

The flight simulator 1, according to the present invention, is easily movable, as is better described hereinbelow, so that it can be transported each time to different locations according to the use needs.

The flight simulator 1 comprises an external structure 2 defining a space 3 in which a pilot station 4 is housed along with data processing means serving for the operation of the flight simulator 1 itself.

The pilot station 4, which accurately reproduces the cockpit of an aircraft, comprises at least one seat 6, on-board instrumentation 7 and relative control means, not illustrated in the figures.

As described above, the on-board instrumentation 7 and the control means correspond with those actually present on board the pilot cabin of the aircraft

whose operation it is intended to simulate.

The pilot station 4 also comprises a windshield and, possibly, one or more small lateral windows, shaped according to the simulated aircraft.

5 At the windshield of the nacelle and the possible small windows, at least one screen 8 can be positioned, outside the cockpit, frontally for the pilot seated at the controls. Such screen 8 is adapted to reproduce the virtual environment in
10 which the flight steps are simulated, with reference for example to the panorama, to the atmospheric conditions, as well as to the runway for the take-offs and landings.

According to a further version of the present
15 invention, not illustrated in the figures, the at least one screen 8 can be positioned outside the windshield of the nacelle and spaced therefrom.

In such case, as a non-limiting example, the at least one screen 8 can be obtained by means of a
20 movable structure comprising at least one panel or cloth or a similar element and at least one projector by means of which images are projected on the panel or cloth or a similar element, images adapted to reproduce the environment surrounding the
25 simulator in the various flight steps.

The aforesaid movable structure can comprise at least one screen adapted to project the images that reproduce the surrounding environment and, in such case, the use of projectors is not necessary.

5 According to a further version of the present invention, at least one first screen 8 can be frontally positionable with respect to the pilot seated in the pilot station 4 and at least one second screen 8 can be laterally positionable with
10 respect to the pilot station 4 in order to increase the width of the visual field of the simulated environment provided to the pilot.

The reproduction of the images on the at least one screen 8 is managed through the data processing
15 means 5 according to modes that are known in the field.

According to one version of the present invention, audio reproduction means are comprised in the space 3 in order to simulate the sounds produced by the
20 aircraft during the flight steps, thus to confer a greater degree of realism to the simulation.

Within the space 3, in proximity to the least one pilot station 4, at least one service station can be comprised, indicated overall with the number 9; from
25 such service station 9, it is possible to manage the

operating parameters of the flight simulator 1.

The at least one service station 9 comprises at least one data processing logic unit 10 connected to the data processing means 5.

5 The logic unit 10 comprises a calculation unit, at least one screen 11 and a keyboard 12 by means of which it manages, sets and verifies the operating parameters of the flight simulator 1.

In accordance with requirements, a specialized
10 person, such as a flight instructor or a pilot, can occupy the at least one service station 9, also during the course of the simulation, in order to modify the operating parameters of the flight simulator 1, or simply to verify the maneuvers
15 executed by the pilot during the simulation and, possibly, to provide technical support.

The flight simulator 1 according to the present invention can be easily moved and transported to a place of interest for its use.

20 For such purpose, according to one version illustrated in figures 1 and 2, the external structure 2 can be supported by movement means 19.

More in detail, the external structure 2 can be associated together with the movement means 19.

25 According to one version, the movement means 19

comprise at least one wheel, drivable in rotation, associable with the external structure 2.

With reference to the embodiment illustrated in figures 1 and 2, the movement means 19 correspond to
5 a load surface of a movable wheel-type vehicle of the type approved for road circulation, as described in the rest of the description.

In such case, the movable wheel-type vehicle can be of motorized type or a trailer or a non-motorized
10 trolley that can be removably connected to a motorized wheel-type vehicle.

According to one version of the present invention, illustrated in figures 1 and 2, the external structure 2 can correspond to the rear body of a
15 road vehicle, such as a van with cab.

According to a further version of the present invention, the external structure 2 is positionable in a trailer suitably adapted or in a container for trucks.

20 According to a further version of the present invention, the external structure 2 can be installed on any movable wheel-type motorized vehicle, approved road circulation, comprising a load space.

According to a further version of the present
25 invention, the external structure 2 is installed on

the open load bed of a motor vehicle or of a trailer that can be removably connected to a motor vehicle without departing from the protective scope of the present invention.

5 In such case, an external protection cover can be provided for the transportable flight simulator 1, not illustrated in the figures, for example a tarpaulin, or a cover arranged with another material.

10 With reference to the embodiment illustrated in figures 1 and 2, the external structure 2 corresponds to the rear body 13 of a van with cab, provided with at least one large closure door 14.

In such case, the space 3 corresponds with the
15 interior of the rear body 13.

The at least one large closure door 14 allows completely closing the space 3, insulating it from the outside.

During transport, the closure of the space 3 allows
20 protecting the above-indicated internal components of the flight simulator 1.

During the use of the transportable flight simulator 1, however, the possibility of insulating the space 3 from the outside environment, prevents the pilot,
25 engaged in the simulation, from being distracted by

stimuli coming from outside the transportable flight simulator 1, e.g. lights and/or noise.

The space 3 can be acoustically and/or thermally insulated from the outside environment by means of
5 the use of suitable insulating panels 15.

If a thermal insulation of the space 3 is provided, the transportable flight simulator 1 can comprise a climate control unit 16 placed outside the external structure 2 (figure 1), adapted to ensure
10 comfortable climate conditions, such as temperature and humidity, inside the space 3 itself.

This has proven to be particularly advantageous in the cases where the vehicle, on which the flight simulator 1 is installed, is placed in particularly
15 hot or cold settings during the operation of the flight simulator 1.

According to a further version of the present invention, the external structure 2 can comprise aeration pipes, not illustrated in figures, adapted
20 to place the space 3 in fluid communication with the outside environment and connectable to an external climate control group.

The flight simulator 1 can comprise electrical connection means adapted to connect the simulator to
25 a network for the electrical power supply of the

flight simulator 1 devices.

In a further version, the flight simulator 1 can comprise a generator power supply group 17 or the like, adapted to ensure, even in case of emergency, the autonomous electrical power supply of the devices of the flight simulator 1 itself, if a connection to an electricity network is not available.

The flight simulator according to the present invention can comprise means 18 for accessing the space 3 such as, for example, a ramp or a small ladder or the like, adapted to facilitate the entrance/exit into/from the space 3 of the flight simulator 1.

According to one version, the access means 18 can be configured to allow carriages or the like to access the space 3 and comprise, for example, an elevator or at least one movable ramp or similar devices, drivable in lifting with respect to the ground.

In figure 4 a further embodiment of the transportable flight simulator according to the present invention, indicated overall with the reference number 100, is illustrated.

Hereinbelow, for indicating the components corresponding to those described above, the same

reference numbers will be used, increased by one hundred.

The flight simulator 100 differs from the preceding embodiment with regard to the shape of the external
5 structure 102 which, substantially, is obtained starting from the fuselage of an aircraft or from at least one portion thereof.

With reference to the version illustrated in figure 4, the external structure 102 reproduces the nacelle
10 of an airplane where the pilot station is present.

Nevertheless, further embodiments are possible, not illustrated in the figures, in which the external structure 102 can be shaped like the entire fuselage of an airplane or a helicopter, or an aircraft in
15 general.

In such case, the external structure 102 can be obtained starting from a portion or from the entire no-longer-used fuselage of an aircraft, thus accurately reproducing the shape of the aircraft
20 itself. The external structure 102, equipped with the components described for the preceding embodiment, can be associated with movement means 119.

More in detail, the movement means 119 can comprise
25 one or more undercarriage portions of the simulated

aircraft itself, associable with the external structure 102 and each comprising one or more wheels.

Analogous to the preceding embodiment, the flight
5 simulator 100 is easily movable and possibly positionable on the trailer of a vehicle for road transport.

According to such version, the wheels of the movement means 119 can be motorized.

10 Therefore, also this embodiment, resulting transportable on road, attains the advantage of being easily movable.

According to a further version, not illustrated in the figures, the movement means 119 can comprise a
15 base, such as a pallet or a support structure, on which the external structure 102 is arranged. In such case, the movement means 119 lack wheels.

The pallet or support structure can comprise seats engageable by the blades of a forklift truck or by
20 lifting ropes or chains, so to move the movement means 119 and hence move the simulator 100 provided therein.

Analogous to that described above, according to such version the simulator 100 positioned on the base or
25 on the support structure can be arranged on the load

surface of a trailer or trolley or similar vehicle for its transport or movement.

With reference to that described above, it is therefore clear that the flight simulator 1, 100 according to the present invention is easily transportable, in a manner such to be easily brought into the spaces where aeronautical events take place transportable, to convention centers or events in general, at companies or aeronautical schools.

10 Since the flight simulator 1, 100 is actually associable with movement means 19, 119, it is easily transportable without requiring the use of cranes or lifting means in general, limiting the use of exceptional transport means to the minimum for its placement on road and subsequent movement.

Indeed, the flight simulator 1, 100 according to the present invention can be positioned within closed spaces, for example parking the vehicle, on which the flight simulator 1, 100 or the flight simulator 20 1, 100 itself is installable, in a warehouse or in a hangar or in other rooms/indoor areas of a different normal destination, or in open spaces, such as parking lots, squares, etc.

The flight simulator 1, 100, comprising a pilot station 4 that accurately reproduces the cockpit of 25

an aircraft, allows simulating the flight steps in an extremely realistic manner. In such sense, the flight simulator 1, 100 can be used for conducting flying license preparatory courses and aircraft crew training courses, or even courses only for cultural requirements.

According to one aspect of the present invention the flight simulator 1, 100 comprises access means 18, 118 possibly configurable for allowing the access of carriages or the like to the space 3, 103, actually allowing the usability of the flight simulator 1, 100 itself to any user, even if the latter has limited motor capacities.

According to a further version of the present invention, not illustrated in the figures, it is possible to connect, to the chassis of a movable motorized wheel-type vehicle or to the chassis of a trailer on which the flight simulator 1, 100 or the flight simulator 1, 100 itself is installable, an inertial platform, removably associable with the ground, in order to allow reproducing the movements of an aircraft during the flight steps, such as yawing and/or pitching and/or rolling. The movements of the inertial platform can be managed through the data processing means 5, 10.

If the flight simulator 1, 100 is associated with a vehicle or trailer connectable with a vehicle, the inertial platform can be of the type retractable within suitable compartments made in the vehicle or
5 in the trailer, so as to not be an obstruction during the road circulation thereof.

The invention thus conceived is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept.

10 All details can be substituted by other technically equivalent elements. In practice, the materials employed, as well as the contingent shapes and sizes, can be of any type according to requirements, without departing from the protective scope of the
15 following claims.

CLAIMS

1. Flight simulator (1, 100), of transportable type,
comprising an external structure (2, 102)
defining a space (3, 103) at its interior, said
5 space (3, 103) comprising at least one pilot
station (4) provided with control means, with at
least one seat (6), with on-board instrumentation
(7), at least one screen (8) for displaying
images, data processing means (5) serving for the
10 operation of said flight simulator (1, 100),
characterized in that said external structure (2,
102) is supportable by movement means (19, 119).
2. Flight simulator (1, 100) according to claim 1,
wherein said movement means (19, 119) are
15 associable with said external structure (2, 102).
3. Flight simulator (1, 100), according to claim 1
or 2, wherein said movement means (19, 119)
comprise at least one wheel, associable with said
external structure (2, 102) and drivable in
20 rotation.
4. Flight simulator (1) according to claim 1 or 2,
wherein said movement means (19) correspond with
the load surface of a movable wheel-type vehicle
of motorized or towable type.
- 25 5. Flight simulator (1, 100) according to claim 1 or

2, wherein said movement means (19, 119) comprise a movable wheel-type vehicle such as a trailer, removably associable with a motorized wheel-type vehicle.

5 6. Flight simulator (1) according to claim 1, wherein said external structure (2) corresponds with the body of a truck or with a container.

7. Flight simulator (100) according to claim 1, wherein said external structure (102) corresponds
10 with a portion of or the entire fuselage of an aircraft.

8. Flight simulator (100) according to claim 1 or 7, wherein said external structure (102) is obtained starting from at least one portion of a no-
15 longer-used aircraft.

9. Flight simulator (1, 100) according to claim 1, wherein said space (3, 103) comprises at least one service station (9), at said at least one pilot station (4, 104), suitable for housing, at
20 the same time as the pilot at least one specialized person, such as a flight instructor or a pilot.

10. Flight simulator (1, 100) according to the preceding claim, wherein at least one service
25 station (9) comprises a data processing logic

unit (10) connected to said data processing means (5), comprising a calculation unit, at least one screen (11) and a keyboard (12).

11. Flight simulator (1, 100) according to claim 1,
5 wherein said external structure (2, 102) comprises at least one movable door (14, 114) for closing said space (3, 103).

12. Flight simulator (1, 100) according to one of the preceding claims, comprising access means (18,
10 118) configurable as a ladder or a ramp and adapted to facilitate the entrance/exit into/from said space (3, 103).

13. Flight simulator (1, 100) according to the preceding claim, wherein said access means (18,
15 118) comprise a movable ramp, drivable in lifting with respect to the ground.

14. Flight simulator (1, 103) according to claim 1, wherein said space (3, 103) is acoustically and/or thermally insulated from the outside
20 environment by means of insulating panels (15).

15. Flight simulator (1, 100) according to the preceding claim, comprising a climate control unit (16) adapted to ensure comfortable climate conditions for a user inside said space (3, 103).

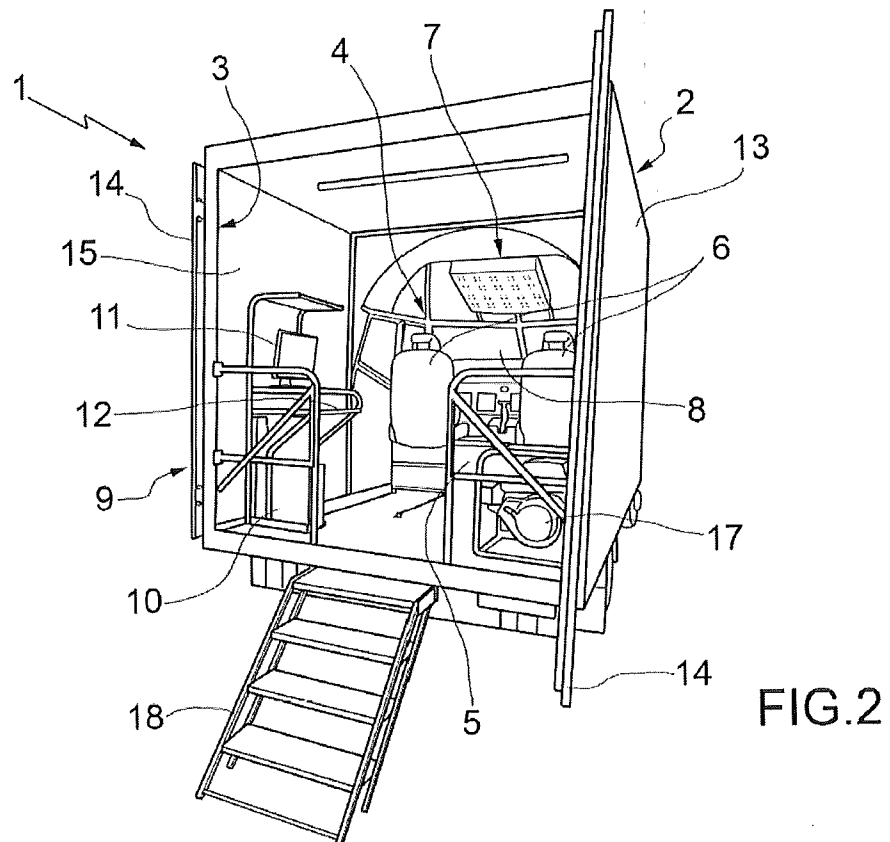
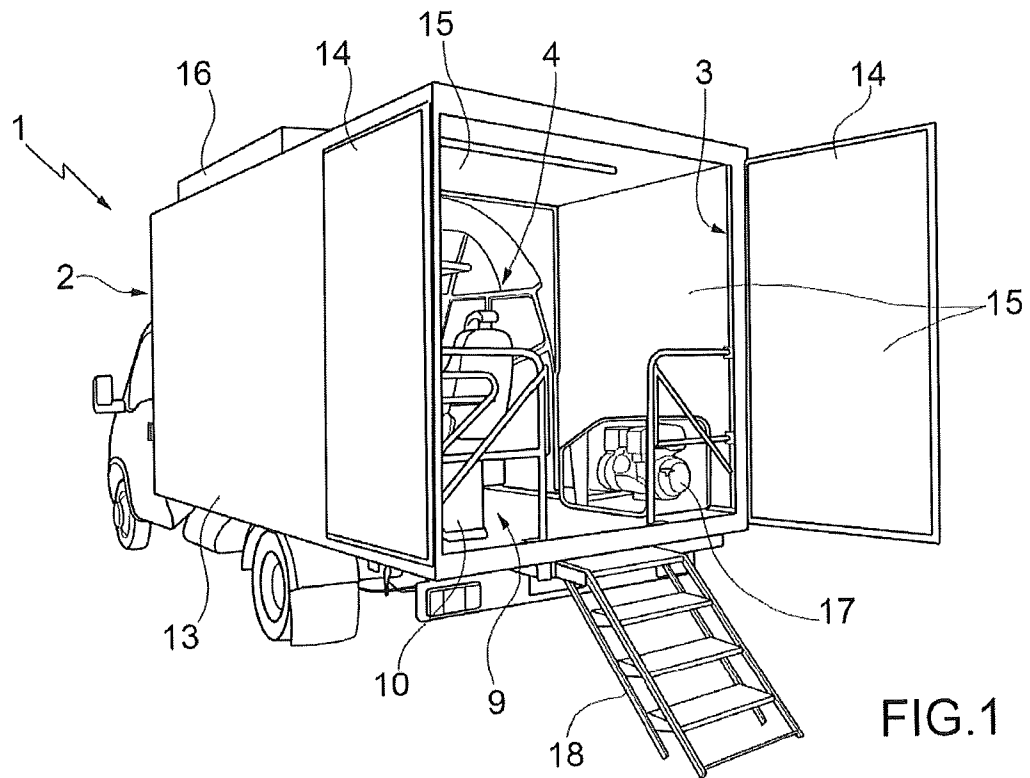
25 16. Movable wheel-type vehicle, for road circulation,

characterized in that it comprises a flight simulator (1, 100) comprising an external structure (2, 102) defining a space (3, 103) at its interior in which at least one pilot station
5 (4) is positioned, provided with at least one seat (6), with on-board instrumentation (7), and with data processing means (5) serving for the operation of said flight simulator (1, 100).

17. Movable wheel-type vehicle according to the
10 preceding claim, wherein said wheel-type vehicle is of motorized type.

18. Movable wheel-type vehicle according to claim 16,
wherein said movable wheel-type vehicle is a trailer that can be removably connected to a
15 motorized wheel-type vehicle.

19. Movable wheel-type vehicle according to claim 16,
wherein said external structure (2, 102) reproduces the shape of at least one portion of the fuselage or nacelle of an aircraft.



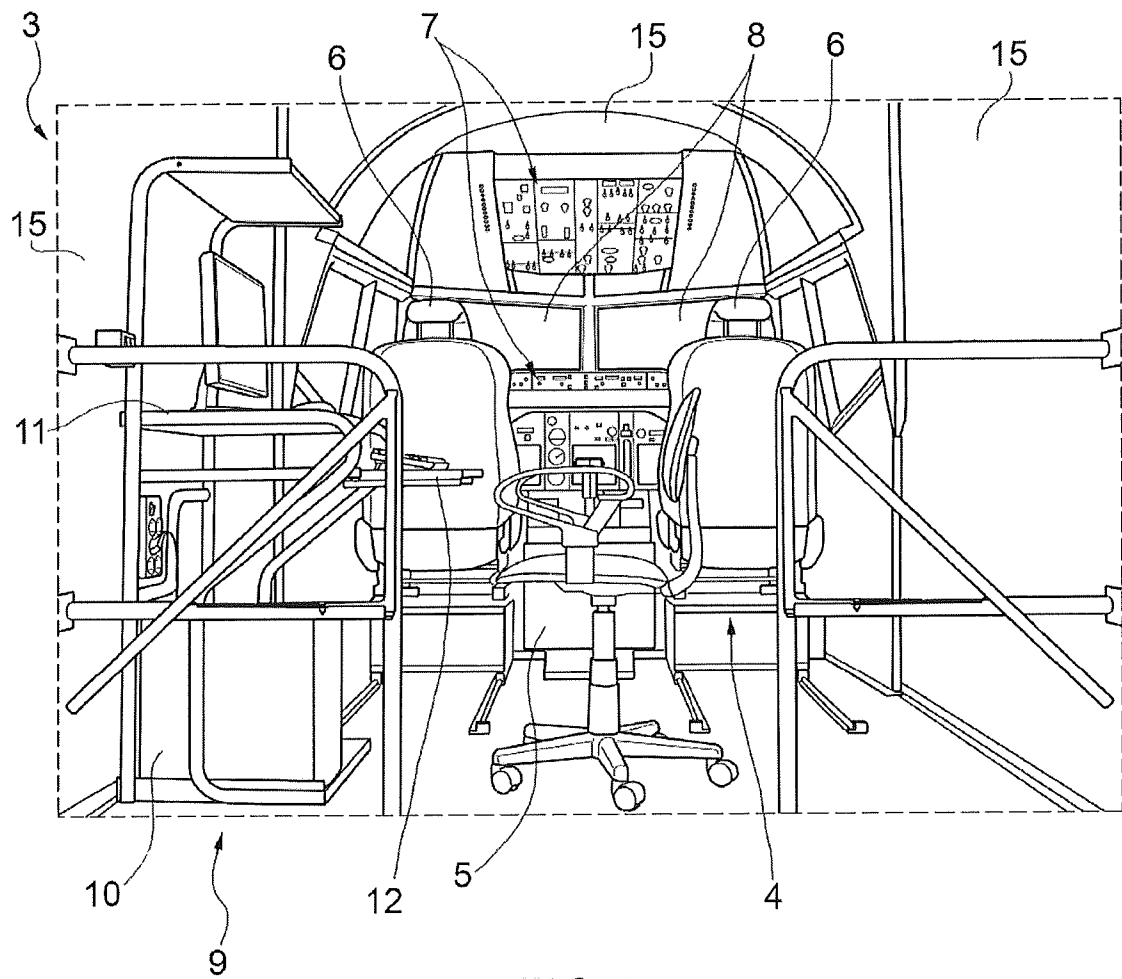


FIG. 3

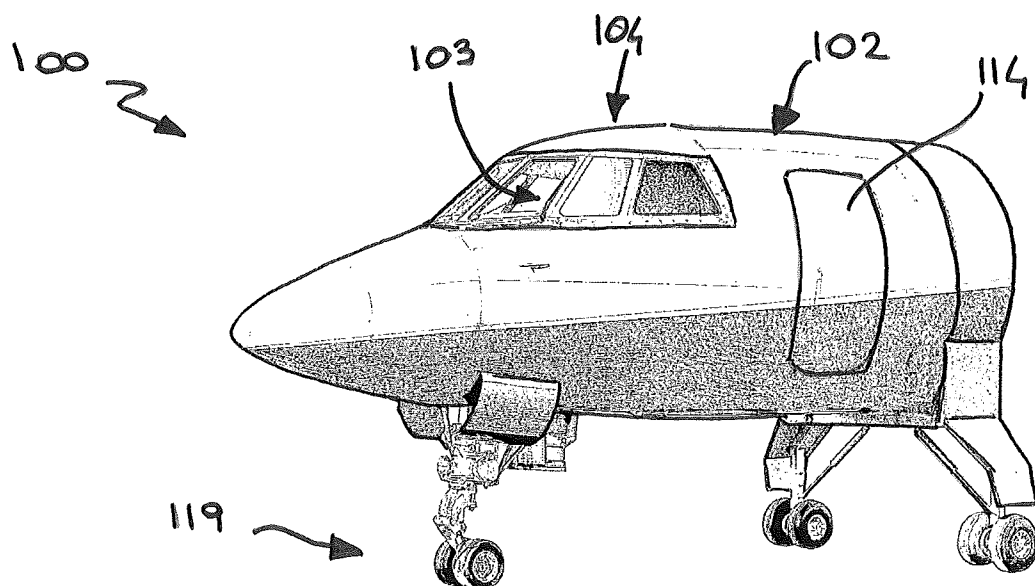


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2014/065589

A. CLASSIFICATION OF SUBJECT MATTER

INV. G09B9/08 G09B9/30 B60P3/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B60P G09B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	Anonymous: "F-4 Phantom Thunderbird Simulator - A Tribute the F-4 Phantom Fighter Jet & USAF Thunderbirds", 6 September 2013 (2013-09-06), pages 1-3, XP055169067, Retrieved from the Internet: URL:https://web.archive.org/web/20130906004525/http://f4sim.com/f-4-phantom-thunderbird-restoration.html [retrieved on 2015-02-11] pages 1-3	1-19



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

12 February 2015

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Giemsa, Falk

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2014/065589

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Anonymous: "F-4 Phantom Thunderbird Simulator - A Tribute the F-4 Phantom Fighter Jet & USAF Thunderbirds", 6 September 2013 (2013-09-06), pages 1-2, XP055169073, Retrieved from the Internet: URL:https://web.archive.org/web/20130906024238/http://f4sim.com/new-trailer.html [retrieved on 2015-02-11] pages 1-2	1-19
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X	----- KR 100 965 419 B1 (DAEATI CO LTD [KR]) 24 June 2010 (2010-06-24) abstract; figure 2	1,6,16, 18
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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