

**TITLE: HANDLING SYSTEM OF AN AIRCRAFT AND NAVAL PLATFORM
EQUIPPED WITH SUCH A SYSTEM**

5 The present invention relates to a versatile system for the safe handling of a vertical take-off and landing aircraft.

 The invention further relates to a ship platform equipped with at least one such handling system.

10 More particularly, the invention relates to the safe handling of such aircraft with skid gear.

 Such aircraft comprise, for example, helicopters and/or rotary wing drones, which are used in many applications and from a wide variety of platforms.

 It is known that the handling of aircraft equipped with pneumatic landing gear is already well mastered in the state of the art.

15 On the other hand, the handling of aircraft with skid gear is still relatively difficult.

 For example, in order to handle and move such aircraft, operators may need to temporarily attach wheels to the skids to facilitate the movement of the aircraft.

 It is understandable that this requires the intervention of operators, is relatively restrictive in terms of handling and takes time.

20 Furthermore, such aircraft can be operated from naval platforms such as surface ships, offshore platforms or any other type of fixed or mobile platform, in relatively harsh environments, for example due to weather conditions.

 For example, on a surface vessel, such aircraft must be able to be handled from the landing platform to a storage hangar and vice versa in complete safety.

25 However, these skid aircraft are mostly of low to medium weight compared to a heavy air-cushioned helicopter.

 As a result, the environment quickly has a detrimental influence on the stability of the aircraft, which can affect its integrity and which can become dangerous for nearby operators.

30 Finally, as the landing, reception or storage areas for this type of aircraft on such vessels can often be cramped, it is advisable to pool as much as possible the means of handling the various types of aircraft and other loads that may coexist on board such a vessel.

35 Indeed, there is a considerable increase in the use of drones in various applications in addition to helicopters.

 The purpose of the invention is therefore to solve these problems.

To this end, the object of the invention is a multipurpose system for the safe handling of a vertical landing and take-off aircraft equipped with a skid landing gear, characterised in that it comprises means forming a motorised trolley for handling the aircraft and also equipped with means for gripping and lifting the aircraft landing gear to facilitate its handling.

In other features of the system according to the invention, taken alone or in combination:

- the means for gripping and lifting the aircraft's landing gear comprise clamps for gripping the skids and/or hoops of the landing gear;
- the means for gripping and lifting the landing gear are mounted on lifting arms of the handling trolley means;
- the lifting arms are articulated to the rest of the handling trolley means and are movable between a lowered position for gripping or removing the landing gear and a raised position for lifting it;
- the lifting arms are movable between their lowered and raised positions via cylinder means;
- the handling trolley means comprise means for securing the aircraft in position for safe handling;
- the securing means comprise friction plate means;
- the friction plate means are movable between a retracted position in the handling trolley means and an extended position locking the handling trolley means in position;
- the handling trolley means comprise motorisation means and energy storage means arranged in the lower part of the handling trolley means to promote stability.

According to another aspect, the invention also relates to a naval platform equipped with at least one landing/take-off area for at least one aircraft and at least one handling system as described above.

The invention will be better understood upon reading the following description, given only as an example, and with reference to the attached drawings, in which:

- [Fig 1] Figure 1 is a perspective view illustrating a means for the safe handling of an aircraft according to the invention,
- [Fig. 2] [Fig. 3] [Fig. 4] Figures 2, 3 and 4 illustrate perspective views of motorised handling trolley means forming part of a system according to the invention,
- [Fig. 5] [Fig. 6] Figures 5 and 6 show side views of such motorised trolley means in the position of gripping and lifting a landing gear of the aircraft, respectively,
- [Fig. 7] [Fig. 8] Figures 7 and 8 show inverted views of motorised trolley means forming part of a handling system according to the invention, and

- [Fig. 9] [Fig. 10] Figures 9 and 10 represent detail views of an example of an embodiment of means for securing such motorised trolley means in a retracted and deployed position respectively.

A versatile system for the safe handling of an aircraft is illustrated in these figures, and in particular in Figure 1.

In Figure 1, the antenna is designated by the general reference 1.

In the example shown in this figure, this aircraft is a vertical landing and take-off aircraft, for example on a landing zone 2 of a naval platform.

A landing grid 3 of a type known per se in the state of the art can be recognised in this matter.

The aircraft is for example a drone or a light helicopter.

This type of aircraft is equipped with a skid gear.

In fact the aircraft landing gear 1 has for example two side skids, one of which is designated by the general reference 4 in these figures.

These skids, e.g. 4, are connected to the rest of the airframe 1 by e.g. hoops, one of which is designated by e.g. the general reference 5 in these figures.

The handling system according to the invention comprises motorised trolley means for handling said aircraft, said motorised trolley means being designated by the general reference 6 in said figures.

These means can be controlled, for example, by a handling operator shown in Figure 1.

Conventionally per se, these motorised trolley means comprise, for example, electrical energy storage means and an electric motor for driving rollers or motorisation wheels thereof.

These rollers or wheels naturally have anti-slip properties.

In fact, these motorised trolley means 6 also include means for gripping and lifting the aircraft landing gear 1, to facilitate its handling.

In the example shown in these figures, the motorised handling trolley means comprise a motor block designated by the general reference 7, from which side arms 8 and 9 respectively extend.

These arms 8 and 9 are then adapted to engage under the aircraft 1 in the vicinity of, for example, its landing gear skids.

As illustrated in these figures, these side arms 8 and 9 of the handling trolley means then comprise means for gripping and lifting the aircraft landing gear 1 to facilitate its handling.

These gripping and lifting means may then include grippers for gripping the skids and/or hoops of the landing gear.

In the example shown in Figure 2, these gripping and lifting means comprise, for example, clamps for gripping the skids of the aircraft landing gear, such as the clamp designated by the general reference 10 in this Figure 2, for gripping, for example, the skid 4 of the aircraft landing gear 1.

In Figure 3, the means for gripping and lifting the aircraft's landing gear comprise clamps for gripping hoops of the landing gear, such as the clamp designated by the general reference 11 in this figure, for example for gripping a hoop 12 of the landing gear.

A combined seizure of the skids and hoops can of course also be considered.

These gripping and lifting means are then mounted on lifting arms associated with the side arms of the handling trolley means 6.

These different means are illustrated in more detail in Figures 4, 5 and 6.

In these Figures 4, 5 and 6, the handling trolley means 6, the motor block 7 of the latter and the side arms 8 and 9 respectively of the latter can still be recognised.

The means for gripping and lifting the aircraft landing gear, such as the clamps described above, are then mounted on lifting arms, e.g. 13 and 14, hinged to the rest of these handling trolley means.

These lifting arms are movable, as illustrated in these Figures 5 and 6, between a lowered position for gripping or removing the landing gear from the aircraft 1 and a raised position for lifting it.

In the lowered position shown in Figure 5, it is possible to grasp or release the aircraft's landing gear, for example in the corresponding landing zone.

In the raised position, the landing gear is lifted off the ground and it is then possible to move the aircraft.

This movement of the lifting arms 13 and 14 between their lowered and raised positions is ensured for example via cylinder means associated with a linkage for moving the arms of the trolley means under the control of an operator.

These cylinder means are designated by the general reference 15 in Figure 4 and these means are associated with a linkage for moving the arms designated by the general reference 16 in this figure.

Advantageously, the motorisation unit and the energy storage means are arranged in the lower part of the trolley-shaped means, for example at the same level as the side arms thereof, i.e. under the lower position of the lifting arms.

The mass of the trolley and aircraft assembly is thus concentrated at the bottom of the assembly, promoting the stability of the assembly.

Different possible ways of realising these means of movement can of course be envisaged.

It is therefore easy to see that the use of such handling equipment is relatively simple.

5 All a handling operator has to do is place it under the aircraft.

He then places the grippers on the skids and/or hoops of the aircraft's landing gear to secure the aircraft to these handling trolley means.

He then raises the lifting arms to lift the aircraft, which enables him to move the aircraft by controlling the motorisation means of the trolley.

10 The operator can then move the aircraft to a new location.

On arrival, the operator places the landing gear on the ground and disconnects the landing gear from the grippers.

He can then move the trolley means to release the aircraft.

15 The motorised trolley means may be in the form of a common base that can be shared between different functions.

Indeed, these handling means can be used to handle aircraft, for example of different kinds, as long as the interface between the handling trolley means and the aircraft can be adapted.

20 These means can also be used to handle other loads such as equipment, weapons and the like.

The handling trolley means are also equipped with, for example, position locking means to secure the handling of the aircraft or the like.

These securing means may for example include suction cup means which have already been developed elsewhere by the applicant.

25 These means are then triggered by the operator and enable the handling trolley means to be secured in the landing area.

Other means of immobilisation such as friction plate means can be considered.

An example embodiment of such friction plate means is shown in Figures 7, 8, 9, and 10.

30 The figures show the handling trolley means 6 with the motor block 7 and the side arms 8 and 9.

As illustrated, each side of the actuator block 7 and for example the ends of the side arms 8 and 9, may be equipped with friction plate means such as those designated by the general references 17, 18, 19 and 20 respectively in these Figures.

35 These friction plate means have superior adhesion and anti-slip properties to the landing area than the rollers or wheels of the handling trolley means in order to secure them.

These friction plate means are then movable between a retracted position in the handling trolley means and an extended position locking the handling trolley means in position

This is depicted in Figures 9 and 10, respectively.

5 In fact, the friction plate 17 can be seen on these Figures, which is carried by a mobile assembly designated by the general reference 21 on these figures, associated with elastic thrust means designated by the general reference 22 and a deployment member designated by the general reference 23.

10 In the retracted position, the plate 17 is then raised relative to the landing area, allowing the motorised trolley means 6 to move.

When the operator wishes to secure these motorised means in position, he then triggers the deployment of the plates via the deployment means 23, which causes the plates to deploy against the landing area and the trolley means to be immobilised in position.

15 These immobilisation means allow a great deal of freedom of use of the handling trolley means and in particular to dispense with guiding means such as rails arranged in the handling area.

The use of these means of handling is then possible while maintaining the stability of the whole in difficult operational conditions such as a force 4/5 sea.

20 This is also made possible by the particular arrangement of the motor block and energy storage means in the lower part of the trolley means, for example at the same level as the side arms, i.e. under the lower position of the lifting arms.

In fact, the mass of the assembly formed by the handling trolley means and the aircraft is concentrated at the bottom of the assembly, which favours the stability of the assembly.

25 It is therefore conceivable that the system according to the invention is extremely versatile and flexible and can solve a number of problems related to the operational cohabitation of different functions in a given environment, such as a limited and hostile environment in terms of platform movements and relative wind in the handling area.

30 Furthermore, it is not constrained by rails or other guiding means as can be found in systems of the state of the art.

Of course, there are many other possible ways of implementing this system.

CLAIMS

1. A multipurpose system for the safe handling of a vertical landing and take-off aircraft (1) equipped with a skid landing gear, characterised in that it comprises means (6) forming a motorised trolley for handling the aircraft (1) and also equipped with means (10, 11) for gripping and lifting the aircraft landing gear to facilitate its handling.

2. The multipurpose handling system according to claim 1, characterised in that the means for gripping and lifting the aircraft landing gear (1) comprise clamps (10; 11) for gripping skids (4) and/or hoops (12) of the landing gear.

3. The multi-purpose handling system according to claim 1 or 2, characterised in that the means (10; 11) for gripping and lifting the landing gear are mounted on lifting arms (13, 14) of the handling trolley means (6).

4. The multipurpose handling system according to claim 3, characterised in that the lifting arms (13, 14) are articulated to the rest of the handling trolley means (6) and are movable between a lowered position for gripping or depositing the landing gear and a raised position for lifting it.

5. The multipurpose handling system according to claim 4, characterised in that the lifting arms (13, 14) are movable between their lowered and raised positions via cylinder means (15).

6. The multipurpose handling system according to any of the preceding claims, characterised in that the handling trolley means (6) comprise means (17, 18, 19, 20) for immobilising the aircraft in position so as to secure its handling.

7. The multipurpose handling system according to claim 6, characterised in that the securing means comprise friction plate means (17, 18, 19, 20).

8. The multipurpose handling system according to claim 7, characterised in that the friction plate means (17, 18, 19, 20) are movable between a retracted position in the handling trolley means and an extended position of locking the handling trolley means in position.

9. The multipurpose handling system according to any of the preceding claims, characterised in that the handling trolley means (6) comprise motorisation means

and energy storage means disposed in the lower part of the handling trolley means (6) to promote their stability.

10. A naval platform equipped with at least one landing/take-off area for at least one aircraft and at least one handling system according to any of the preceding claims.