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Locking Assembly for Aircraft Door

Field of Invention

5 The present invention relates to a locking assembly for securing a door assembly of an aircraft.

Background

Preventing unauthorized access to aircraft during maintenance or storage is a major security issue for aircraft operators.

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When an aircraft is on the ground for maintenance in the apron an authorised employee, such as engineer or technician, may gain access to the aircraft cabin primarily through cabin access steps. When an aircraft is to be left unattended, the existing practice is to remove these access steps to prevent unauthorised access to the cabin. However, this could be particularly unproductive when the authorised employee needs to leave the aircraft for a short period of time.

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To maintain aerodynamic efficiency, a door of an aircraft, when closed, is generally flush with the aircraft fuselage. Accordingly, there is no locking flange for attaching a conventional lock. Modifications of the door for installing lock fittings may not be allowed due to other regulatory, operational and security concerns.

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In the event the access steps are not removed, it follows that an unauthorized person may be able to open the door and gain access to the aircraft while the door is closed but not locked. Normally, one or more security staff has to be deployed to address this security issue. However, this requires increased cost.

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The present invention aims to provide a locking assembly for addressing such a security issue.

5 **Summary of Invention**

In general terms, the present invention provides an assembly for locking a door of an aircraft by disabling access mechanism of the handle to prevent operational access to the handle of the door, instead of securing the door assembly against the fuselage.

- 10 In one aspect, the invention provides a locking assembly for securing a door assembly of an aircraft, the door assembly comprising a door body; a flush mounted door handle and an access mechanism for providing operational access to the door handle, said locking assembly comprising: a first section mountable to the door assembly such that the first section is prevented from removal when the door handle is closed; and a
15 second section engageable to the first section for preventing operation of the door handle or access mechanism.

- Both sections of the locking assembly may be made of stiff sheet material, such as metal plates. The locking assembly may be easily attached to the door body and/or
20 door handle of the aircraft and can then be locked with a conventional padlock.

- This provides an additional level of security to prevent unauthorised access to the aircraft. The otherwise required number of security staff may be reduced, and thus resulting in reduction of cost. Additionally, the productivity may be increased as the
25 authorised employee can now conveniently lock the door with the maintenance steps

left attached to the aircraft whenever he/she is leaving the aircraft for a short period of time for another assignment or to obtain tooling, spares, etc.

5 The design of both sections may be adapted to fit the door of a particular type of aircraft according to the arrangement of the door handle and the access mechanism on the door.

10 The first section comprises an anchoring portion which may be mounted to the door body and/or the handle, through inserting into the gap between the handle and the door body.

15 According to the design and location of the access mechanism on the door of an aircraft, the second section may include a stopper portion, a notch portion or a cover portion for preventing operation of the access mechanism and thereby preventing any opening operation of the handle.

20 The first section further comprises a first engagement portion; and the second section further comprises a second engagement portion; wherein the second engagement portion is engageable with the first engagement portion.

The first and second engagement portions may include cooperating flanges for receiving a padlock so as to fixedly couple the first and second sections.

The locking assembly may further include a third section such that engagement of the first and second sections is achieved indirectly through the third section.

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Further, there is no need for any modification to the door of the aircraft for the fitting of the locking assembly.

Brief Description of Drawings

5 It will be convenient to further describe the present invention with respect to the accompanying drawings that illustrate possible arrangements of the invention. Other arrangements of the invention are possible, and consequently the particularity of the accompanying drawings is not to be understood as superseding the generality of the preceding description of the invention.

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Figures 1A, 1B and 1C are various views of a door assembly for different types of aircraft.

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Figure 2 shows an isometric view of a locking assembly according to a first embodiment of the invention for securing a door of an aircraft.

Figure 3 shows various views of the locking assembly of Figure 2.

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Figure 4 shows the locking assembly of Figure 2 mounted to the door assembly of an aircraft.

Figure 5 shows various views of a locking assembly according to a second embodiment of the invention.

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Figure 6 shows various views of a locking assembly according to a third embodiment of the invention.

Detailed Descriptions of Embodiments

- 5 As shown in Figure 1A, the cabin door 10 of a Boeing 777 aircraft comprises a door body 12, a flush mounted door handle 14 and an access mechanism 16 including two push-in flaps 16A. The handle 14, in closed position, rests in a recess of the door body, and must be pulled out from the recess before an opening operation can be performed. The push-in flaps 16A are for providing operational access to the door handle 14.
- 10 Unless the flaps 16A are pushed in, the handle 14 cannot be pulled out from the recess and thus cannot be operated.

The procedure of opening the door 10 of a Boeing 777 aircraft is as follows:

- 1). pushing in the flaps 16A;
 - 15 2). pulling the handle 14 from the recess;
 - 3). rotating the handle 14 180 degrees in the direction of the "OPEN" arrow printed on the door 10; and
 - 4). pulling the door 10 outward.
- 20 Figure 2 shows a locking assembly 100 according to a first embodiment of the invention suitable for securing the door of a Boeing 777 aircraft as shown in Figure 1A. The locking assembly 100 comprising two parts: A first section 110 and a second section 120. The main body of both sections 110 and 120 may be made of stiff sheet material, such as metal plates.

Further, a third section may be provided such that engagement of the first and second sections is achieved indirectly through the third section. The third section may be a linking member to engage with both the first and the second sections.

5 The first section 110 has a first anchoring portion 112A and a second anchoring portion 112B. The anchoring portions 112A, 112B allow the first section 110 to be fitted to the door 10. In this embodiment, the first section 110 can be mounted to the door body 12 by inserting anchoring portions 112A, 112B into the gap between the door body 12 and the handle 14 as shown in Figure 4.

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The anchoring portions 112A, 112B may be of step shape as shown in Figure 3. While the door handle 14 is closed, namely resting in the recess as shown in Figure 4, the step shaped anchoring portions are able to prevent the first section 110 from being removed.

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The first section 110 further comprises a first engagement portion 114 attached to the main body of the first section 110. The engagement portion 114 comprises a locking tab 116 with an aperture 118. The tab 116 is engageable with a corresponding second engagement portion 124 of the second section 120.

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Shown in Figure 2, the second section 120 comprises a first stopper portion 122A, a second stopper portion 122B and a second engagement portion 124. Each of the two stopper portions 122A, 122B also has a step shape and can be inserted into the gap between the handle 14 and the each of the flaps 16A. The tips of the steps are able to prevent the two push-in flaps 16A from moving inward. This has effectively disabled the access mechanism and consequently operational access to the handle 14 is prevented.

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The second engagement portion 124 of the second section 120 is arranged to engage with the first engagement portion 114 of the first section 110. The second engagement portion 124 comprises two tabs 126A and 126B, each being attached to the main body of the second section 120 and having an aperture 128A, 128B. The two tabs 126A, 126B are laterally positioned and separated by a gap allowing the insertion of the tab 116 of the first section 110.

Shown in Figure 4, on engagement of the first and second sections 110 and 120, the apertures 118, 128A and 128B are aligned allowing the hasp of a padlock to be inserted so as to fixedly couple the first and second sections. Once engaged and locked, it prevents unauthorised removal of any section of the locking assembly 100, and thus an unauthorised person would not be able to operate the access mechanism 16 to gain operational access to the handle 14.

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Alternatively, the first and second engagement portions 114 and 124 may be shaped and/or arranged for engaging a third section. For example, the third section may comprise two movable parts adapted to engage with the first and second engagement portions 114 and 124, respectively. The third section may further comprise a locking device for preventing relative movement of the two parts to disengage the first and second engagement portions.

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Because the door 10, when closed, is generally flush with the aircraft fuselage, and is normally designed such that it can only be opened with operation on the handle 14, the door 10 is effectively locked once operation of handle 14 is prevented. Instead of securing the door assembly against the fuselage, the locking assembly 100 locks the

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handle 14 of the door by disabling the access mechanism 16 of the handle to prevent any operational access to, or opening operation of, the handle 14.

By disabling the access mechanism 16 with the stopper portions 122A and 122B, operational access to the handle 14 is prevented. An unauthorised user will not be able to perform step 1) of the opening procedure, i.e. pushing in the flaps 16A, which is stopped by the tips of the stopper portions 122A, 122B; and consequently he/she will not be able to perform any of the subsequent steps 2) to 4) in order to open the door. Thus, the door 10 is effectively locked.

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A locking assembly 200 according to a second embodiment of the invention is shown in Figure 5, which is suitable for securing the door of a Boeing 747 aircraft as shown in Figure 1B.

Figure 1B shows the handle portion of the cabin door 10 of a Boeing 747 aircraft. The door 10 comprises door body 12 having a recess, a butterfly handle 14 resting in the recess and an access mechanism 16 including a handle release button 16B. The handle release button 16B comprising a knob with a neck portion. In closed position, the butterfly handle 14 is retained in the recess until the handle release button 16B is pressed.

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The procedure of opening the door 10 of a Boeing 747 aircraft is as follows:

- 1). pushing the handle release button 16B;
- 2). pulling both ends of the butterfly handle 14 from the recess;
- 3). rotating the butterfly handle 14 180 degrees in the direction of the "OPEN" arrow printed on the door 10; and

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- 4). pulling the door 10 outward.

The locking assembly 200 as shown in Figure 5 also includes two sections, a first section 210 and a second section 220. Both may be made of metal plates.

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The first section 210 comprises an anchoring portion 212 and a first engagement portion 214. The anchoring portion 212 is formed in hook shape, which can be inserted into the gap between the handle 14 and the door body 12, and hooked against the inner side of the handle 14 to prevent removal of the first section when the handle is closed. The first engagement portion 214 comprises a tab with an aperture 218 for engagement with a second engagement portion 224 of the second section 220.

The second section 220 comprises a notch portion 222 and a second engagement portion 224. The notch portion 222 includes a U-shaped notch for engaging the neck portion of the handle release button 16B to prevent the knob from being pressed down. The second engagement portion 224 includes a slot opening, through which the tab of the first engagement portion 214 can be inserted.

On engagement, the tab of the first engagement portion 214 is inserted into the slot of the second engagement portion 224, and the hasp of a padlock may be inserted into the aperture 218 for fixedly coupling the two sections 210 and 220. Unauthorised removal of any section of the locking assembly 200 is prevented. The notch portion 222 has disabled the handle release button 16B and thereby operational access to the door handle 14 is prevented.

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An unauthorised user will not be able to perform step 1) of the opening procedure, i.e. pushing the handle release button 16B, because it is blocked by the notch portion 222 of the second section 220; and consequently he/she will not be able to perform any of the subsequent steps 2) to 4) in order to open the door. Thus, the door 10 is effectively
5 locked.

Figure 6 shows a locking assembly 300 according to a third embodiment of the invention for securing a door 10 of an Airbus A380 aircraft as shown in Figure 1C.

10 The door 10 of an Airbus A380 aircraft comprises a door body 12, a handle 14 and an access mechanism 16 including a flap 16C on the handle itself for providing operational access to the handle. Pushing in the flap 16C allows a user to grasp the handle 14 and lift it up. An "OPEN" switch 18A and a "CLOSE" switch 18B are provided in the recess covered by the handle 14, and can be only accessed when the handle 14 is lifted up.

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The procedure of opening the door 10 of an Airbus A380 aircraft is as follows:

- 1). Pushing the flap 16C to grasp the handle 14;
- 2). Lifting the handle 14 up to a horizontal position; and
- 3). Pressing the "OPEN" switch 18A.

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The locking assembly 300 for the door of this third type of aircraft, again, comprises at least a first section 310 and a second section 320.

The first section 310 comprises an anchoring portion 312 for mounting onto the handle
25 14, an opening 318 and a first engagement portion 314. The anchoring portion 312 includes three hook structures 312A, 312B and 312C for fitting to the two lateral sides

and the end of the handle 14. When the first section 310 is mounted to the handle without the second section 320, the opening 318 still allows a user to push the flap 16C to grasp the handle 14.

- 5 To mount the first section 310 to the handle 14, the user will first lift the handle 14 slightly; then, fit the first section 310 onto the handle from the end with the opening 318 aligned with the flap 16C; and lastly, close the handle 14. In the closed position, the hook structures are inserted into the gap between the handle 14 and the door body 12, and hooked against the inner side of the handle 14 to prevent the first section 310 from
10 being removed.

The first engagement portion 314 includes two tabs 316A and 316B, each with an aperture. The two tabs 316A and 316B are laterally positioned and separated by a gap for engagement with the corresponding second engagement portion 324 of the second
15 section 320.

The second section 320 comprises a cover portion 322 and a second engagement portion 324. The cover portion 322 may be the main body of the second section. The second engagement portion 324 includes a tab 326 with an aperture for engagement
20 with the first engagement portion 314. Upon engagement, the cover portion 322 covers the opening 318 of the first section 310 to prevent the flap 16C on the handle from being pressed.

On engagement of the first section 310 and the second section 320, the tab 326 of the
25 second engagement portion 324 is inserted in the gap between the two tabs 316A, 316B of the first engagement portion 314. The cover portion 322 covers the opening

318 and thus prevents pushing operation of the flap 16C. The apertures of the tabs are aligned for the insertion of a hasp of a padlock.

5 While the two sections 310 and 320 are engaged and locked, unauthorised removal of any section of the locking assembly 300 is prevented. An unauthorised user will not be able to perform step 1) of the opening procedure, i.e. pushing operation of the flap 16C, which is covered by the cover portion 322 of the second section 320; and consequently he/she will not be able to perform step 2) lifting the handle 14, or step 3) pressing the "OPEN" switch 18A. Thus, the door 10 is effectively locked.

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In all of the above embodiments, there is no need for any modification to the door of the aircraft for the fitting of the locking assembly. A skilled person would appreciate that various designs of the locking assembly are possible, within the scope of the invention, to fit the door of different types of aircraft.

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Claims

1. A locking assembly for securing a door assembly of an aircraft, the door assembly comprising a door body; a flush mounted door handle and an access
5 mechanism for providing operational access to the door handle, said locking assembly comprising:

a first section mountable to the door assembly such that the first section is prevented from removal when the door handle is closed; and

a second section engageable to the first section so as to prevent operation of
10 the door handle or access mechanism.
2. The locking assembly of claim 1, wherein the first section comprises an anchoring portion mountable to the door body.
- 15 3. The locking assembly of claim 1, wherein the first section comprises an anchoring portion mountable to the door handle.
4. The locking assembly of claim 2 or claim 3, wherein the anchoring portion is shaped to be insertable into a gap between the handle and the door body.
- 20 5. The locking assembly of any one of claims 1-4, wherein the access mechanism comprises at least one flap adjacent to the latch; and the second section comprises a stopper portion for preventing movement of the flap.

6. The locking assembly of any one of claims 1-4, wherein the access mechanism comprises a knob; and the second section comprises a notch portion engageable with the knob.
- 5 7. The locking assembly of any one of claims 1-4, wherein the second section comprises a cover portion for covering the access mechanism so as to prevent operation of it.
- 10 8. The locking assembly of any one of the preceding claims, wherein the first section further comprises a first engagement portion; and the second section further comprises a second engagement portion; wherein the second engagement portion is engageable with the first engagement portion.
- 15 9. The locking assembly of claim 8, wherein the first and second engagement portions include cooperating flanges for receiving a padlock so as to fixedly couple the first and second sections.
- 20 10. The locking assembly of claim 1, further including a third section such that engagement of the first and second sections is achieved indirectly through the third section.